Transport Canada
Aviation Forecasts Conference Proceedings

50th Anniversary of the DC3

Air, Statistics and Forecasts
Policy and Coordination

CA1
DTR 110
86
T11

Canada

CA1
DTR110-
86
T11

430369

41.D

.CA1
DTR 110
86
T11

TC AVIATION FORECASTS CONFERENCE PROCEEDINGS

OCTOBER 1986

MAR 15 1990

Transport Canada / Transports Canada

AIR STATISTICS AND FORECASTS

POLICY AND COORDINATION

430369

DDN 430360

90-04094/

TABLE OF CONTENTS

	PAGE
PROCEEDINGS OVERVIEW	1
Welcome & Opening Remarks General R.M. Withers, Deputy Minister, Transport Canada	3
Economic & Demographic Outlook Mike McCracken, Informetrica Limited	13
Policy Outlook Valerie Dufour, Transport Canada	21
SESSION I - Air Carrier Outlook	
Major Carrier Peter Barker, Canadian Pacific Airlines	32
New Entrant Robert Obadia, Nationair Canada	42
Commuter Operator Paul McKnight, Air Ontario	48
Financial Outlook Steve Garmaise, Wood Gundy Inc.	59
SESSION II - General Aviation Outlook	
Business Aviation Hugh Whittington, Canadian Aviation	66
Private Aviation Bill Peppler, Canadian Owners & Pilots Association	72
Recreational Flying Victor Whitmore, Ultralight Pilots Association	77

PAGE

SESSION II- Technological Outlook

Large Commercial Jet Aircraft 84
R.W. Leonard, McDonnell Douglas Corporation

Aero Engine 106
Gerald L. Brines, Pratt and Whitney Aircraft

Turbo Prop Aircraft 117
Bruno Diesner, De Havilland Aircraft of Canada

Transport Canada Aviation Forecasts 138
Lloyd A. McCoomb, Transport Canada

PROCEEDINGS OVERVIEW

The Second Canadian Aviation Forecast Conference was held in Ottawa-Hull, Canada on October 21, 1986. The general theme of the presentations was the outlook for the industry in the coming decade.

The keynote address was delivered by General Ramsey Withers, Deputy Minister of Transport Canada, who dealt with issues such as Regulatory Reform, Aviation Safety and Cost Recovery.

Following the keynote address, Mr. Mike McCracken, President of Informetrica Ltd. presented an outlook for the Canadian economy as well as a regional breakdown of such key factors as economic growth, unemployment and personal disposable income. Mr. McCracken was followed by Mrs. Valerie Dufour, Director, Domestic Policy, Transport Canada, who briefly reviewed the history of airline deregulation and examined its impact to-date.

The first panel, moderated by Mr. Jim Smith, Vice-President, Economics, Air Transport Association of Canada, addressed the air carrier outlook. Each panelist provided their perspective of that portion of the industry market he represented.

The panel members were:

Mr. Peter Barker, Vice-President, Canadian Pacific Air Lines,
Mr. Robert Obadia, President, Nationair Canada, and
Mr. Paul McKnight, Director of Marketing, Air Ontario.

The last presentation of the morning was made by Mr. Steven Garmaise, Communications and Transportation Analyst, Wood Gundy Inc. Mr. Garmaise focussed on the financial performance of the industry and the outlook for the future.

Mr. Victor Pappalardo, President, City Express, was the luncheon speaker. He presented the future of the industry from the point of view of a Canadian operator in the newly-emerging, less-regulated environment.

The second panel, moderated by Mr. Hugh Whittington, addressed issues that impact general aviation users, such as cost of new aircraft, insurance and fuel, supply of pilots and competition from ultra-light recreational flying.

The panel members were:

Mr. Hugh Whittington, Editor and Publisher, Canadian Aviation Magazine,
Mr. Bill Peppler, Manager, Canadian Owners and Pilots Association,
Mr. Victor Whitmore, President, Ultralight Pilots Association.

The next panel, moderated by Mr. Marc Brenckmann, Director, Research Development, Transport Canada, examined development presently underway in the jet and non-jet aircraft manufacturing industry in terms of air frame and aero engines, size (very large aircraft), range, speed and cost, etc.

The panel members were:

Dr. Robert W. Leonard, Director, Program Engineering Advanced Technology, McDonnell-Douglas Corporation,
Mr. Gerald Brines, Manager, Advanced Engine Programs, Pratt & Whitney, and
Mr. Bruno Diesner, Economist, DeHavilland Aircraft of Canada.

The last presentation of the day was made by Dr. Lloyd McCoomb, Director, Air Statistics and Forecasts. Dr. McCoomb presented an overview of the Transport Canada Aviation forecasts.

The following sections of this report contain the presentations of the aforementioned speakers. A text of Mr. Pappalardo's speech was unfortunately unobtainable.

WELCOME AND OPENING REMARKS

General Ramsey M. Withers

Deputy Minister,
Transport Canada

Biographical Highlights:

A native of Toronto, General Withers' career began in 1948 with the Canadian Forces. In 1952 he graduated with an electrical engineering diploma from the Canadian Service Colleges in Victoria, B.C. and Kingston, Ont. After serving in Korea he returned to Canada in 1953 to obtain a Bachelor of Science degree in electrical engineering from Queen's University. Upon graduation he served as signal officer in Canada and in the Federal Republic of Germany. Returning to Canada in 1959, he completed the course at the Canadian Army Staff College in Kingston enabling him to serve as a staff officer of the 4 Canadian Infantry Brigade Group in Germany. In 1963, after completing the course at the Joint Service Staff College in Latimer, England, he assumed command of 6 Signal Squadron, Valcartier, Québec.

Between 1965 and 1970, General Withers progressed through successively more responsible positions in the field and at headquarters. In 1970 he was appointed first commander of the newly-formed Northern Region and in 1973 was awarded the Commissioner's Award for Public Service in the N.W.T. That same year he held executive positions in the information management systems and policy fields in Ottawa. In 1976 he assumed command of Canadian Forces Europe. His appointments since have included Vice-Chief of the Defence Staff in 1976, the Order of Military Merit in grade of Commander in 1977, and Commander of the Order of St. John. He also holds the Canadian Forces decoration. In 1980 he was promoted to the rank of General and appointed Chief of the Defence Staff and Principal Commander of the Order of Military Merit.

General Withers has been Deputy Minister, Transport Canada since 1983 upon retiring from the Canadian Forces. In recognition of Mr. Withers' contribution in the field of transportation, he was presented with the Outstanding Achievement Award of the Public Service on 21 May 1986.

WELCOME AND OPENING REMARKS

RAMSEY M. WITHERS

DEPUTY MINISTER
TRANSPORT CANADA

Welcome to the Second Aviation Forecast Conference. I am sure that all of you attending today, both those from Government agencies, as well as those from the private sector, are acutely aware of many changes in the aviation business since the first conference held in 1981.

Who, at that time, could have predicted the severity of the economic recession in 1982 and 1983, and its impact on aviation in Canada? Who, in 1981, would have predicted that the world price of oil would fluctuate so drastically, and cause such dramatic distortions in the regional economies of our country? Other major events which have had significant consequences for the airline industry, and for our ability to forecast accurately the air traffic in Canada, include the threat of international terrorism for airlines and airports, and the change in the attitude of the public toward Government regulation of the economics of air transport.

These shifts away from patterns and ways of doing things in the past have rendered previous forecasts invalid. A fresh outlook was required based on the circumstances of today, and the perceived conditions for the future.

Today, we shall have that fresh outlook, not only as seen through the eyes of Government forecasters, but also from the points of view brought here by private sector business people who are intimately involved with both the day-to-day business of delivering a vital service to the consuming public, as well as the longer-term requirements of planning for the future.

From our perspective, two major objectives have governed our approach to shifting the focus and direction of involvement with aviation.

First, there was a need to reduce government regulation of the economics of aviation; specifically, involvement in who could enter the business, providing what type of service, what level of fares, and what degree of competition.

Secondly came the need to reduce the size of the Federal deficit.

Keeping these objectives in mind, two main areas of change were targeted; the environment and the organization.

A. Changing the Environment

To change the environment, six key areas have been identified where the priorities of the department should be concentrated. These are: safety, economic regulatory reform, subsidy reduction, downsizing operations, cost recovery, and, last but not least, efficiency and effectiveness.

While all of these priorities will govern the changes required in the transportation environment, four of the priorities will be in the forefront of change. Therefore, I would like to sketch out our actions with respect to regulatory reform, safety, cost recovery and downsizing.

First, let me speak about regulatory reform.

The introduction to this change, to the public, began with the release in July 1985 by the Honourable Donald Mazankowski, of the position paper entitled "Freedom to Move". It constitutes a framework for transportation reform that is in keeping with the times. It is consistent with the Government's intention to lessen regulation, and encourage a higher degree of competition.

Legislation has been introduced which embodies a comprehensive declaration of national transportation policy. The key elements on which this policy is based are:

- safety of the transportation system is the top priority;

- the transportation system exists to serve the needs of shippers and travellers;

- competition and market forces are to be the prime agents in providing economic, efficient and adequate transportation services at the lowest unit cost;

- in order to encourage competition from within and among the transportation modes, economic regulation of carriers will be minimized;

- carriers should, as far as practicable, bear a fair share of the costs of facilities and services provided at public expense, and should be compensated for publicly-imposed duties;

- while transportation is a derived demand, it is a key factor in regional development; and

- undue obstacles to the mobility of all, including disabled persons, should not be created by carriers.

In case you are worried that the combination of economic regulatory reform and the Government's expenditure reduction program will mean that resources will not be adequate to ensure provision of a safe and secure transportation system, let me assure you that this will never happen.

The enhancement of transportation safety remains the fundamental component of Transport Canada's mandate.

Our most recent initiative in this area has been a proposal made by our Minister, the Honourable John Crosbie, at the International Civil Aviation Organization in Montreal. He has sought agreement to make terrorist attacks on airports an international crime. The Canadian proposal has received support from more than 30 nations, including the United States.

To put the issue of safety in the broader context of overall departmental activity, let me say that:

- over $1.2 billion is committed annually, and 13,000 person-years support the present safety programs in both Transport Canada and the Canadian Transport Commission. These safety programs have been, and will continue to be, strengthened. (For instance, over the last two years, 220 new staff have been added in the areas of aviation safety, transportation of dangerous goods, and highway safety).

- Many types of new, comprehensive endeavours have been initiated which will substantiate this claim of never compromising transportation safety.

- For instance, major safety initiatives in the area of air safety include:

  (i) In late 1984, the Canadian Aviation Safety Board was established with responsibility for investigating aviation occurrences, identifying safety deficiencies, and formulating safety recommendations;

(ii) passage of the amendments to the Aeronautics Act in June 1985. These legislative changes can be said to be the most fundamental improvement to enhance aviation safety since the end of the First World War;

(iii) the Civil Aviation Tribunal, an independent agency, became operational in June 1986, with responsibility for review of suspensions, penalties, and refusals to renew aviation documents;

(iv) to further strengthen our enforcement capabilities, over 100 new inspection and other safety positions are being added to the present complement of 800 inspection and enforcement staff to allow for more frequent on-site safety investigations, audits and follow-ups;

(v) extensive new technology is being introduced to modernize our radar and aircraft landing control systems at a cost of several hundreds of million dollars over the next five years. This new technology will considerably improve aviation safety by providing more precise information on air traffic and hazardous weather conditions;

(vi) these enhancements are part of a more comprehensive 10 year airspace system improvement plan which will introduce new and more efficient control systems, microwave landing systems, automated weather reporting equipment and ground-to-air communications facilities;

(vii) increased efforts at safety training and education of air industry personnel have begun with concentration on working with chief executive officers and their aviation safety staff to appreciate areas of potential risk and opportunities for improvement;

(viii) we recognize that the move toward economic regulatory reform of the Canadian transportation system is already changing the environment, as is clear from the re-structuring actions well known to everyone here. As the environment, in which our safety regime functions, continues to evolve, we are monitoring our regulations and enforcement

procedures. Close consultation with the industry and foreign governments has been ongoing, but is now being focussed on efforts to learn from the type and nature of air incidents world wide. I am confident that potential risks which we could face in Canada will be avoided as these risks are identified early, and adjustments are made to our safety regime where appropriate.

The Air India disaster and the recent attacks of international terrorists have shown that we must use every means, both human and technological, to upgrade airport safety and security.

Among the numerous steps we have taken to address the threat of international terrorism, airport security and screening procedures have been strengthened considerably; and an additional $60 million has been allocated over the next three years to improve physical security at airports, as well as training of personnel and public education. In close cooperation with other security agencies of the Government, we have instituted security threat and risk analysis procedures to determine adequate levels of security protection.

On the basis of what I have just outlined, I am confident that we are on the right track in enhancing transportation safety and security in our country.

Certainly, there is always room for improvement. Certainly, it will require the cooprative efforts of all governments, the transport industry through its own programs, safety organizations, security agencies, and the public at large.

But, on the basis of our past and present performance and results, I believe that our future cooperative efforts will result in further success toward our mutually committed goal of making the Canadian transportation system one of the safest and most secure operating systems in the world.

The third major area of change is downsizing. Over the period 1985/86 to 1990/91, the Government directed Transport Canada to make annual reductions which started with $75 million in 85/86, rising to $600 million in 1990/91. In addition, the May 1985 budget called for a capital reduction of $34 million in 85/86 and $22 million for the other years to 1990/91. We also received a one shot reduction of $50 million in 1986/87 in the February, 1986, budget. What this means is that the reference levels for

Transport Canada will go from the level of $3 billion in 85/86 to $1,733 million in 1990/91. We also will not be provided with inflation, which in itself represents a reduction of $91 million in 87/88, rising to $192 million in 1990/91. In order to meet these targets, we must scrutinize our operations carefully with a view to eliminating activities, to reducing levels of service where they are now more than adequate, increasing cost recovery from the users of our services, and transferring responsibility for activities to others, wherever possible.

The Government believes not only that the deficit must be reduced by cutting expenditures, but also that the Government's role in the economy has become too large, with the result that the private sector is being crowded out. This means that we are obliged to scrutinize our operations carefully with a view to eliminating activities, to reducing levels of service where they are now more than adequate, or to transferring responsibility for the activity to others.

We will have to ask ourselves some hard questions. Is this service/activity still required; i.e., is the demand still valid? Are others able and willing to undertake it -- either on a purely commercial basis, or on behalf of the department? Could the level of service being provided be reduced without significant negative impacts, particularly in the safety area? Can the service be provided more effectively or efficiently?

A major undertaking of this sort has already received approval in principle, namely the examination of a new airport management structure that would be more financially viable, and more responsive to local needs.

Our fourth major area of change is through increasing cost recovery.

Events in the past few years have resulted in an increased emphasis on cost recovery. The Government's intention to reduce the deficit has resulted in higher fees and charges, along with measures to reduce costs. The Auditor General has noted that a greater portion of costs should be recovered, as did the Ministerial Task Force on Program Review.

The Department still provides many facilities and services for little or no fee. Total aviation expenditures are estimated at over $1.4 billion in 1986/87, compared to revenues of approximately $740 million. About half of the expenditures are being funded by the general taxpayer and half by users of facilities and services. Revenues from users come approximately 50% from the air transportation tax, 25% from concessions, and 25% from user charges levied on aircraft operators.

As part of the effort to increase the level of cost recovery, several issues are being examined. Questions related to what share of the costs should be attributed to users, the method of recovering costs, and the amount of time required to achieve cost recovery objectives are being investigated. Another issue concerns consultation with users regarding the extent to which they would be involved in investment decisions regarding capital projects for which they would be expected to pay. The Department is currently studying these issues to develop a comprehensive cost recovery policy proposal for consultation with the air transport industry.

Having described what we have done, and will be doing, to change the regulatory environment, I wish now to talk about changes in the organization of the Department.

B. Changing the Organization

The major policy change presented in Freedom to Move, and now about to be put before Parliament as the new National Transportation Act, as well as amendments to associated acts:

the emphasis on safety, and, once again, attendant legislative action;

the new structure for airports management; and

the deficit reduction targets, cost recovery and the imperative to reduce overheads are all factors which have led to the necessity of creating a new approach to Transport Canada's organization.

I would like to give you a short overview of the major changes which have been implemented to date.

First of all, in line with "Freedom to Move", the economic policy and planning functions have been consolidated under the Assistant Deputy Minister Policy and Co-ordination for all modes. This group includes the unit responsible for air policy as well as an economic analysis section to provide statistics and forecasts.

Thus, our modal groups, aviation, marine, and surface are now clearly devoted to the objectives of operations and safety.

The Airports Authority group has been formed to provide an enterprise which will focus on commercial orientation, and implement the future structure which will feature local authorities in many regions of the country. The transition vehicle will be decided by the Government in the months ahead.

Our overhead reduction activities have included centralization and consolidation of Finance, Personnel, Planning and Review functions, as well as the elimination of one supervisory level throughout the Department. The resultant savings are in the order of 1,700 person-years.

Having reviewed some of the changes which have occured since the previous aviation forecast convention, let me now focus on changes expected in the future. The Policy area will be discussed by Valerie Dufour, the Director of Domestic Policy. The traffic and activity forecasts, which are described at some length in the report you received at the Registration Desk, will be presented by Lloyd McCoomb, who has been responsible for organizing the conference, and securing the services of the expert speakers and chairmen you will see here today.

From the program, it is evident that you have a very full calendar of events ahead of you. I wish you all a most productive day in discussing these important issues. Undoubtedly, they will bring forth many points of view, and I hope a degree of consensus as well for the future of aviation in Canada.

ECONOMIC AND DEMOGRAPHIC OUTLOOK

Michael C. McCracken

President,
Informetrica Limited

Biographical Highlights:

Mike McCracken is a senior advisor to government agencies, corporations, and associations, in both Canada and the United States, on current and long-term economic policy, economic forecasting and the use of econometric tools.

Mr. McCracken is President of Informetrica Limited. This firm provides detailed economic forecasts for the Canadian economy, specific industries, and regional dimensions for clients in the public and private sectors. The Company also undertakes economic impact studies, benefit-cost studies, and other quantitative economic research, as well as developing computer and information systems to assist in such research.

Related outside activities include participation on the Statistics Canada National Accounts Advisory Committee and on the Chamber of Commerce Economic Policy Committee.

ECONOMIC AND DEMOGRAPHIC OUTLOOK: ENVIRONMENT FOR CANADIAN AVIATION

M.C. McCracken, President, Informetrica Limited

1 WHAT MATTERS?

- Demographics - For general aviation the number of new pilots is directly linked to the 20-24 age group. Number of passengers- families, immigration, age-sex mix.
- Real growth - GDP and mix will influence cargo, business passengers. Resource growth relatively slow will hurt passenger and cargo. Personal disposable income - affects pleasure, general aviation.
- Interest rates, exchange rates, and inflation - Lover interest rates will reduce costs of acquiring aircraft. Less pressure on maintaining low inventory levels may hurt cargo.
- Fuel Prices - Lover world oil prices will help control costs, aid general aviation. Key is the amount by which fuel costs actually decline. Partly a question of government taxation and policy. The high fuel component should reduce air transportation costs relative to other modes and relative to the CPI.
- Structural Policies - Deregulation. It is happening! Bilateral Enhanced Trading Arrangement(BETA) will increase U.S.-Canadian traffic and lead to more competition but a larger market.
- Deficit reduction - Squeeze on real incomes. Less willingness to subsidize, more emphasis on cost recovery.
- Tax reform - Lives for M&E lengthened; shorter for construction. Investment tax credit gone; lover tax rates. Business Transfer Tax is coming; broad base, rate of 6 per cent or more.

2 WHAT IS EXPECTED TO HAPPEN?

2.1 DEMOGRAPHIC GROWTH, 1986-91

POPULATION. Growth of 1% per year is expected, down slightly from the 1.1% growth over the past ten years. Lov fertility rates are expected to continue; net immigration will provide about 30% of the growth. A 1991 population of 27 million is expected, compared to 25.6 million in 1986.

HOUSEHOLDS. The number of households will increase from 9.1 million in 1986 to 9.9 million in 1991, an average annual increase of 1.7%. This compares with the more rapid pace of 2.9% per year over the 1976-85 period.

NET IMMIGRATION. An average level of 70,000 per year is assumed for the years 1987-91. This is higher than the average of about 50,000 in the 1981-86 period.

LABOUR FORCE. Growth averaging 1.4% per year will be much slower than the 2.4% growth rate of the last ten years. Part of the slowdown is attributable to slover growth in the source population, the balance to less rapid growth of participation rates, particularly for females.

The population slowdown is not unique to Canada. U.S. rates are also declining to the 1% range. Fertility rates of less than 2.1 births per female imply belov-replacement levels. At present, there are about 1.65 births per female; this drops to 1.4 by 2005. The situation is clouded by the fact that the post-war "baby boom" has produced a bulge of females of child-bearing age, leading to a stable or slightly rising number of births throughout this decade, in spite of the fall in fertility rates.

The big story on the population side is the change in the age distribution of the population over the next 10 years and beyond. If we focus on the age group 20-24, in 1985 there were 2.319 million; in 1995 there will be 2.038 million, over 280 thousand fever, or a decline of 12 per cent! This age group is an important source of new employees, first-time buyers of consumer durables, and a mobile group relative to older age groups. It is also the primary source of new pilots for general aviation!

The number of persons over 55 will increase from 4.732 million in 1985 to 5.9 million by 1995, a 24.6 per cent increase. (Total population increase is only 10.5 per cent over the same period.)

2.2 REAL ECONOMIC GROWTH

1986 - Economic growth will be approximately 3.2%, somewhat slower than the revised view of 4% in 1985. The improved trade performance and a stronger residential construction sector offset the slower growth in other sectors. Oil and gas investment declines dominate the strong investment in other sectors.

1987 - Growth drops to about 3.1% since slower consumption and private investment growth outweigh increases in net exports and government investment. Energy investment weakens further.

1988-91 - Economic expansion weakens, averaging 2.3% per year. Most sectors expand slowly, except for exports which drop in the U.S. recession year 1989.

2.3 INFLATION

1986 - Inflation continues to decline; the CPI increases by only 3.5% in 1986, compared to 4.3% in 1984 and 4% in 1985. Low oil prices help to offset the effects of sales tax increases and a 72 cent dollar.

1987 - CPI growth drops to under 3% as oil prices remain low and natural gas prices decline. The appreciation of the Canadian dollar helps to keep prices under control.

1988-91 - Inflation remains under 4%. Rising oil prices arrest the downward trend in price growth; steady appreciation of the dollar is a partial offset.

The CPI through July, 1986 is still above 4 per cent. But the jump in July was primarily due to airline fares. With lower fuel prices and the spectre of deregulation we should see lower air fares soon. There are no scheduled tax increases until the January, 1987 gasoline tax increase. This too will help bring down the CPI for the balance of 1986.

We have not included a business transfer tax in this forecast. It is likely to be implemented in a non-neutral way that will raise the CPI in the first few months of introduction.

Canada should outperform the U.S. on the inflation front over the next few years. This will result from the delay in energy price drops, the greater degree of slack in labour markets, and the appreciation of the Canadian dollar, affecting 80 per cent of our imports.

2.4 UNEMPLOYMENT

1986 - Employment gains in 1986 total about 360,000 and the unemployment rate declines to 9.6% compared to 10.5% in 1985.

1987 - Modest progress is made in 1987; the unemployment rate averages 9.4% for the year.

1988-91 - Growth at close to potential on average leaves the unemployment rate at 9.4% in 1991. In the "growth recession" of 1989 the rate approaches 10%.

This forecast is not a happy one for the unemployed. Unfortunately, there appears to be little hope of any fiscal stimulus. Depending on private sector growth holds little prospect for employment increases unless there is a major upturn in the resource sector outlook.

Potential growth is about 3 per cent; growth in excess of that is needed for lowering the unemployment rate. A scenario with more rapid U.S. growth, lower interest rates, and perhaps a weaker dollar would be needed.

2.5 INTEREST RATES

1986 - Interest rates decline, with long-term rates dropping by over 150 basis points. Short-term rates average above 9% but by the end of the year the prime rate is close to 9%. Real interest rates remain high. The spread between Canadian and U.S. short-term rates is over 200 basis points.

1987 - The prime interest rate moves below 9% and long-term interest rates stay near 10%. The Canada-U.S. differential narrows to below 200 basis points.

1988-91 - Short-term and long-term interest rates remain around 8% and 10%, respectively. The spread between Canadian and U.S. rates narrows to less than 100 basis points. Real interest rates continue to decline.

U.S. monetary policy and the Canadian exchange rate will continue to dominate the setting of interest rates in Canada. We are assuming that the strength in the dollar, stable U.S. rates, and modest inflation will allow the Bank of Canada to reduce the interest rate differentials with the U.S.

Real interest rates in excess of the growth of the real economy are the root of the problem. The large government deficits, financial difficulties for the resource and agriculture sectors, and LDC debt problems are symptoms of the imbalance. As long as real rates remain high there will be a continuous

redistribution of income from debtors to creditors. This will lead to lack of effective demand since creditors are larger savers. As well there will be increasing attempts to do something about it. This will include "capital taxes" in the form of abrogation of debt; particularly likely with the LDCs and small businesses.

If you believe the monetary authorities will stick it out then you should be more pessimistic about the outlook. If "reason" returns then you could get "bullish".

2.6 EXCHANGE RATES

1986 - The Canadian dollar bottomed out early in 1986, and averages above 71 cents U.S. for the year. Along with the U.S. dollar, the Canadian dollar depreciates substantially vis-a-vis other major world currencies.

1987 - The Canadian dollar appreciates, approaching 73 cents. Some depreciation with the rest-of-world continues.

1988-91 - Good inflation performance, rising resource prices, and a strong external balance led to continued appreciation of the Canadian dollar. An exchange rate of 80 cents is reached by 1991. This appreciation leaves exchange rates with other world currencies stable.

We have been exchange rate optimists for many years. Will we ever be right? At the moment there are two schools of thought. Some on Bay Street are calling for a 68 cent dollar by the end of the year, leading to a sharp increase in interest rates. Others point to the basic strength and suggest that we have overshot the mark, with an expectation of an appreciation to 74 cents soon. As we discovered in early 1986, speculative pressures can materialize quickly and the Bank will act. But have the speculators learned their lesson? At some point the fundamentals will come through, or the fundamentals will change!

2.7 Regional Performance

Over the next five years above-average growth is expected in Newfoundland, Ontario, Manitoba, and Saskatchewan. (The Newfoundland forecast is quite dependent on Hibernia proceeding.) Poor prospects for energy investment will dampen the outlook for Alberta and Nova Scotia, and a slow recovery of metals will hold back British Columbia. A strong manufacturing sector will bring Quebec up to the national average. New Brunswick and Prince Edward Island will grow slightly less than

the national average.

In trying to link this forecast to your industry be cautious! For example, the fall-off in energy investment in Nova Scotia reduces the aggregate; but the manufacturing and services sectors are doing pretty well. The above-average performance of Saskatchewan is attributable to a recovery of agriculture from the droughts of 1984-85. But farm incomes are weak, and other sectors like energy may be declining. A more sophisticated approach is to look at the industry detail and the personal income growth in each region, before deciding on the relevance of the growth patterns to your industry.

3 RISKS TO THE FORECAST

World oil prices could increase substantially, particularly if the Iran-Iraq war leads to increased power of Iran over the Middle East.

We are not anticipating a recession in 1987. A major run on the Canadian dollar with a policy reaction of higher interest rates could trigger it. Other external shocks are also possible.

Other scenarios for the longer term should be considered - BLISS, COLLAPSE.

4 TWO-EDGED SWORDS

Oil Prices. Reduce operating costs, help consumer incomes; but resource investment down and adverse regional effects.

Deregulation. Lower prices, higher capacity utilization.

Lower interest rates. Inventory management less critical, hence less air cargo; but financing costs of new investment down. Depreciation of Dollar vis-a-vis Europe and Japan. More tourist travel originating in these locations; less tourism to these locations. Improved volume of exports to these markets, less imports.

5 FINAL COMMENT

If you remember nothing else, please remember that the future is not forecastable! We can look at conditional forecasts, understand the implications of policy or assumption changes, and anticipate possible challenges. In the final analysis, the

kind of economy that we will have over the next five, ten, or fifty years is, fortunately, not dependent on the economic forecasts.

More than anything else, it depends on you - your investment decisions, the ways in which you develop the skills of your employees, and the judgment that you exercise in insisting on good economic policy from your elected politicians!

POLICY OUTLOOK

Valerie Dufour

Director,
Domestic Air Policy,
Transport Canada

Biographical Highlights:

In her present role as Director of Domestic Air Policy Mrs. Dufour has been involved with work on the new National Transportation Act and with Canada/U.S. air relations. In her prior position as Director, Suface Policy and Co-ordination she was responsible for urban transportation programs and for transportation of the elderly and disabled.

Prior to joining Transport Canada in 1982, Mrs. Dufour held positions in the Privy Council Office, the Federal Provincial Relations Office, the Inter-governmental Conference Secretariat, Secretary of State and the Centennial Commission.

Mrs. Dufour has a B.A. and M.A. in Political Science from the University of Ottawa.

THE POLICY OUTLOOK FOR AIR TRANSPORTATION

Valerie Dufour
Director, Domestic Air Policy
Transport Canada

May I begin by telling you how pleased I am to participate in this second Canadian Aviation Forecast Conference. I would also like to say that, as a newcomer to the aviation sector, I am very aware that I am addressing a group of persons, most of whose experience in this industry far exceeds mine. Moreover conference organizers have given me a tough act to follow.

So let me focus my remarks on the present and the future. The present will deal with how much change has been brought about without changing the legislative framework inside which the airline industry must function, and the future will deal with the proposals contained in the National Transportation Act. I will also cover the direction in which related policies are headed.

Taken together, the present and the future are a demonstration of how economic regulatory reform can be brought about without surprises. Of course this Canadian version has been made easier by having the U.S. experience unfolding with a time lag sufficient for all of us to observe, and plan to avoid, where possible, its negative side.

The Present (1984 - 1986)

A review of the present should go back to the Spring of 1984 when a new Canadian air policy was announced by the Minister of Transport. His assessment, at that time, had been that the airline industry was in decline. The regulatory system, set up over five decades to protect a fledgling industry, was now hindering progress. It had been unable to guarantee service, kept out new entrants and kept real competition and innovation to a bare minimum. Moreover it was necessary to counter the seepage of passenger traffic across the border via U.S. gateways.

So here was the first step in a carefully staged process of liberalization. The essence of the policy was less regulation and more competition - a gesture of confidence to a now mature airline industry. It rejected the concept that the airline industry is a public utility and stressed commercial competition as the basis of a healthy air transport system. The procedure

was to liberalize economic regulation, without a change in legislation.

Highlights of the new policy included asking the CTC to put more emphasis on the benefits of increased competition when judging airline licence applications, to deal with cargo services in the same manner as scheduled services, to free financially fit charterers from entry requirements, to ease restrictions on the type of aircraft to be used and frequency on routes. More flexible pricing regulation was to be introduced.

This new regime was to be in place for that part of Canada below a line running westward from the 50th to the 55th parallel in recognition of the need for greater regulatory protection for the thin, vulnerable routes in the North. However in the south, any new or existing, local, regional, or national carrier could apply to serve any domestic route and air carriers were encouraged to apply to the CTC to consolidate their licences to promote still further competition.

This is not all of it, but enough for you to see the seeds from which later policies have grown. Certainly the airline industry responded positively.

But political fortunes being what they are, while the air industry was preparing to turn around, the government also turned over.

The present government, on coming to power in the fall of 1984, set about to put its own imprint on the future of air transportation policy and reform of transportation policy in general.

Today, "Freedom to Move" has become the catch-phrase for economic regulatory reform not only of air, but of the rail, marine and trucking modes as well.

The previous Minister had shown what could be done without legislative change, by providing clear ministerial direction to the CTC. The new Minister, Don Mazankowski, took it one step further with his July 1985 Policy Paper proposing a new policy and legislative framework. It spoke of the pivotal role transportation plays in our economic well-being and its vital role as an instrument of public policy. It stressed, however, the need to rely on individual initiative, enterprise and competition to ensure an efficient and economic air transportation system.

With respect to the air mode, the following proposals were made:

- entry to any class of domestic commercial air service would be governed by the test of "fit, willing and able", rather than public convenience and necessity. Operators possessing a Transport Canada operating

certificate and having the prescribed liability insurance would be deemed to meet the requirement.

- Market exit would require only advance notice.

- No ongoing regulation of domestic tariffs, although they would have to be made available at business offices, and records kept. The new Regulatory Agency could only examine fare increases on complaint and could overturn or reduce them.

- Air carriers could structure their financing and aircraft acquisitions to meet their operating requirements.

- Provisions would also cover ministerial authority in international air matters.

A new regulatory agency to replace the CTC was proposed, along with reduced restrictions on mergers and acquisitions and provision for compensation for imposed public duties.

Following publication of Freedom to Move, the Minister undertook an extensive process of consultation, which was complemented by work carried out by the Standing Committee on Transport. A year later, in June 1986, a new National Transportation Act was tabled in the House of Commons as Bill C-126. But more of that later.

Without stealing the thunder of the air carrier spokespersons to follow, let us look briefly at where the air carrier industry stands after 2 years of regulatory liberalization and pretty clear signals about the legislative framework of the future.

The commercial air industry has polarized into four groups . As a result of these alliances, jet services are being withdrawn gradually from some short-haul and thin markets and being replaced by higher frequency turbo prop services. This change has not been without frustrations for the travelling public which, at least initially, has often reacted negatively. It is to the credit of Canada's several new regional airlines, that early criticism has been replaced with acceptance and satisfaction with the benefits of improved connections with non-stop long haul flights and international departures.

Taking into account the extent of interlining which has developed, route and frequency decisions, the range of tariffs available, the amount of licence consolidation, the best word to describe the activity of the air industry, at this level, is positioning. Carriers are going about as far as they can within the current framework and are poised ready to operate in a context where there will no longer be a regulatory body looking over their shoulder.

Let me leave it at that. I can however recommend the excellent analysis prepared by Roger Roy of the CTC entitled, "Canadian Air Transport Industry: Recent Trends" and published in the August 1986 Air Transport Monitor. The same can also be said for the excellent Briefing published this month by WESTAC.

The Future (1986 and Onward)

So now all eyes are focussed on the new National Transportation Act, which should be tabled again for First Reading in November. This Bill will have been subjected to some fine-tuning and some sections will read differently than the June version. For those of you who have not had access to the actual Bill, let me present a brief sketch of those aspects pertaining to air.

The Freedom to Move legislation went farther than Mr. Mazankowski's Policy Paper. Differences can be seen which are clearly the result of views expressed to the Minister, to officials and to the Standing Committee on Transport.

The National Transportation Act (NTA) begins with a declaration of policy setting out the principles which will guide the Canadian Transportation system in the future. In a nutshell..... safety of the system is the top priority; the system exists to serve the needs of shippers and travellers; competition and market forces are to be the prime agents for providing economic, effective and adequate services at the lowest total cost; economic regulation of carriers will be minimized and competition within and among the modes will be encouraged. Carriers should bear a fair share of the costs of facilities and services provided at public expense and should be compensated for public-imposed duties. Transportation is recognized as a key to regional economic development. Carriers should not create undue obstacles to the movement of commodities or persons including the disabled.

Part I creates a regulatory body, to be called the National Transportation Agency, whose tasks regarding the air mode will become clear as we look at the chapter on air.

Part II on Air Transportation not only replaces Part II of the Aeronautics Act, it sets down in legislation the foundations of domestic and international air service more extensively than ever before. It specifies the roles and responsibilities of the Minister, the Agency and the licensees with respect to the operation of air services. It has the overall effect of removing the bulk of economic regulation in Southern Canada, modifying the regulation in Northern Canada and maintaining current regulation in international air services.

Part II applies to all domestic air services which are publicly available and excludes the Armed Forces, speciality services, corporate and private aircraft. It covers both scheduled and

non-scheduled international air services. The main licensing requirements are described and those areas requiring regulation are indicated.

Economic regulatory controls will be virtually non-existent in Southern Canada, where the test of "fit, willing and able" will replace "public convenience and necessity", while some entry controls, called the reverse onus test, will apply in Northern Canada, known as the "designated area". All licencees will have to give notice of their intention to reduce or discontinue service and failure to do so could result in action by the Agency.

The legislation states specifically that rotating wing services are uniformly regulated throughout Canada while fixed wing services are covered by two regimes, one for the South and one for the North. In the South no distinction is made between unit toll and charter services.

Three main criteria will be required to obtain a domestic licence from the Agency - be a Canadian in the sense given by the legislation (basically 75% ownership or control); have an appropriate Canadian aviation document, usually an operating certificate, and have the required liability insurance. Similar criteria exist for the international sector. The Minister is given discretion to exempt licensees from the ownership requirements and to set appropriate terms and conditions for such exemptions.

The continued existence of a distinction between Northern and Southern Canada is proof that the consultative process works. The 1985 Policy Paper made no distinctions in domestic service. However teams of officials visited the northern region speaking to interest groups in many communities. The Standing Committee on Transport took a special interest in the issue of northern and remote services and made several recommendations. The result was that in the end it was decided to retain some regulatory protection for that area above the line established in 1984 and now described in the Air Carrier Regulations.

The reverse onus test provides that any interested community person or entity can file an objection against the issuance of a license to serve the north, and the Agency must decide within 120 days on whether the issuance would lead to a significant decrease or instability in the level of service provided.

There are major changes to the regulation of domestic tariffs. In future these will only need to be available for public inspection rather than filed with the Agency. Confidential contracts will be permitted. The Agency will only be empowered to review, disallow or roll-back basic fare increases on complaint, and only in respect of monopoly routes in southern Canada. With respect to fixed wing routes in the North, the Agency will be able to act similarily not only with respect to

basic fare increases but basic fare levels as well. In all cases the Agency may, where practicable, order refunds.

The Minister is given the power to determine that an existing domestic service is essential and that financial assistance is needed to ensure the continuation of some level of service. He may proceed by public tender to determine the most economical and efficient method by which to provide the service.

International services continue to be subject to Canada's bilateral agreements and regulatory control as currently practiced. The legislation provides for the Minister to give binding direction to the Agency on international licensing matters and to designate the Agency as Canada's aeronautical authority. The Minister will continue to designate carriers for international services.

The areas where the Agency may, in the future, make regulations is set out, and what is most significant is the new requirement for the approval of the Governor in Council.

Provision is made for enforcement with fines not exceeding $5,000 and/or imprisonment for up to a year for individuals and fines not exceeding $25,000 for corporations. The Agency may, with Governor in Council approval, identify certain provisions to be "designated", i.e., subject to the procedures set out in sections 6.7 and 7.2 of the Aeronautics Act, and establish fines not exceeding $1,000 for their contravention. These could be called "administrative" fines.

Finally the Bill describes transitional arrangements regarding current licence holders. Existing Class 1, 2, 3, 4, 8, 9-2, 9-3 and 9-4 licences will remain valid for one year during which time they will be converted to new licences with the appropriate conditions. International air service tariffs and schedules will be valid until they expire or are replaced.

So there you have Part II. What else is there which affects the air mode? Well there is Part VII on mergers and acquisitions of Canadian transport firms, whereby the Agency must be advised of any proposed acquisition of an interest of 10% or more of the voting shares (or of all or substantially all of the assets) of a transportation undertaking that has assets or annual sales in Canada of $20 million or more.

Part VIII of the NTA also calls for an annual and a four-year review of the effects of the legislation as well as its operation. This is likely to mean that, while the firm intention is to reduce the reporting burden on carriers, at least for that period, fairly detailed information will need to be provided to the Agency. Details, in this regard, have not been made public, so it remains to be seen what demands will be placed on the carriers.

So where do we go from here? Apart from the Minister's intention with respect to a new First Reading for the Bill, we do not know its Parliamentary timetable. We cannot predict how long it will be in Committee. The air part has been well-received and has sparked relatively little controversy. However, it forms part of a Bill which contains other chapters which may draw extensive debate. Indeed it remains to be seen to what extent opposition parties, lobbies, national organizations or others will try to change the Bill during the legislative process. Clearly the government hopes for speedy and expeditious passage.

In the meantime, it should be business as usual. As I showed earlier, the current policy framework provides plenty of scope for forward-looking, imaginative carriers. Indeed the CTC has continued to liberalize the regulatory context as demonstrated by its recent Notice on changes in its financial fitness policy and its new policy on domestic unit toll air fares.

The air carrier industry, over the next year and beyond, will need to be ready to make its views known not only on the impact of the proposed legislation, but also on cost recovery and on the management of Canada's airport system.

In September the Minister of Transport made public the Report of the Task Force on the Management of the Canadian Airports System. My advice is that the air industry should waste no time in informing the Minister of its views on these proposals, keeping in mind that these are only proposals, not policy, and that this feedback is needed before a policy is developed.

As the Deputy Minister stated earlier, there will be no relaxation of safety regulations. However, certain reforms to improve and better organize the regulations are under way. The Department is working to respond to the changing regulatory needs of the industry by, for example, developing new regulations on licensing and interchange of aircraft and streamlining the handling of air carrier mergers. You are probably aware that the commercial air services regulations are being consolidated and rewritten. A certification information package is being developed to assist new applicants in the preparation of their applications.

Let me also mention the National Air Carrier Information System whereby for the first time Transport Canada will have a centralized data base of air carrier certification information including:

1) tombstone data;
2) certification data on what a carrier is certified for;
3) a history of inspection records;
4) deficiencies and corrective action taken.

On the aviation side, many of you will be aware of the

publication of the second issue of the Canadian Airspace Systems Plan, referred to in Mr. Withers' speech, (the first was in 1983) which responds to updated user requirements, reports progress in sytems engineering design and management and indicates areas in which research will be carried out for planning beyond the year 2000. It communicates proposals to users and hence provides an opportunity for advance planning and for consultation; it informs the Canadian electronics industry of possible future Air Navigation System requirements. Comments are welcomed by its authors.

Shortly you can also expect to be consulted on the principles and guidelines underlying cost recovery.

On the international scene, Canada will be seeking in its negotiations with other countries to establish air agreements which are more flexible with respect to such things as carrier designations, tariffs and capacity. This is in response to the desire of Canadian carriers to expand their international markets.

Short-haul transborder activity is likely to increase. However it is still impossible to say when a new formal round of Canada-U.S. air negotiations will begin. It is our view that the ball is in the American's court and we are waiting for their response to our most recent proposals. Canada is not, at the moment, inclined to undertake issue or route-specific discussions in the absence of some mutual agreement on the principles and long term objectives of our air relations.

As you can see, I've concentrated my remarks on the legislative and policy direction. Now I am looking forward to hearing air industry views on the future. And I am just as interested as you are in hearing what our aviation forecasters will have to say later this afternoon.

Thank you for your attention. Do we have time for any questions?

SESSION I
AIR CARRIER OUTLOOK

Session Chairman

Jim Smith
Vice-President, Economics
Air Transport Association of Canada (ATAC)

MAJOR CARRIER

Peter Barker

Staff Vice President, Airline Planning, Canadian Pacific Air Lines, Ltd.

Biographical Highlights:

Peter Barker was appointed Staff Vice President, Airline Planning in January 1985. In this post, Peter is responsible for the development of both the current and future schedule network plans and traffic expectations for the entire Canadian Pacific Air Lines network.

Before joining CPAL, Mr. Barker held a number of increasingly responsible senior marketing positions with Air Canada, involving him in both the planning and merchandising of the passenger products. He was directly involved in the restructuring of their international operation and development of more sophisticated yield management tools.

Mr. Barker was raised in Montreal and graduated from Queen's University Engineering school in Kingston, Ontario.

In his present position, Mr. Barker undertakes projects that will further development of the 5 continent operations of the airline. This involves the analysis of the customer and technical requirements associated with market opportunities and will culminate in long range business plans for the Airline Division.

An avid skier and sailor. He is a member of the Vancouver Board of Trade. He is married and has 3 children.

CANADIAN FORECAST CONFERENCE

P. BARKER
STAFF VICE PRESIDENT, AIRLINE PLANNING
CANADIAN PACIFIC AIR LINES, LTD

Opening remarks not included)

THE CANADIAN AVIATION COMMERCIAL INDUSTRY CONTINUES TO BE ALTERED DRAMATICALLY. WE HAVE AN OPPORTUNITY HERE TO SUCCEED AS WELL AS TO FAIL ACCORDING TO THE DICTATES OF THE MARKET PLACE RATHER THAN THE WHIM OF THE BUREAUCRATS. THIS EXPERIMENT WILL APPEAR ON THE FRONT PAGES AND BUSINESS PAGES EVERY DAY; AIRLINES WILL BECOME BIG BUSINESS AS WELL AS BIG NEWS.

HERE IN CANADA, WE ARE SEEING A LOOSENING OF REGULATION IN SPITE OF THE FACT THAT WE ARE STILL WAITING THE FINAL DEREGULATION LEGISLATION. THERE ARE THOSE OF US WHO HAVE STRONGLY SUPPORTED DEREGULATION IN THE PAST AND THOSE WHO THOUGHT IT WAS GOING TO BE A VERY DIFFICULT TRANSACTION IN OUR TRANSPORTATION SYSTEM. BE THAT AS IT MAY, I THINK IT IS NOW OBVIOUS TO ALL OF US IN CANADA THAT THERE IS VIRTUALLY NO POLITICAL CONSTITUENCY FOR SLOWING DOWN THE PACE OF DEREGULATION IN MOST OF THE COUNTRY, WITH THE NORTH BEING THE POSSIBLE EXCEPTION.

THE REALITY IS THAT THE PUBLIC AND POLITICIANS CONSIDER IT TO BE A MATURE INDUSTRY WHERE PARTICIPANTS COULD WITHSTAND COMPETITION. AT CANADIAN PACIFIC AIRLINES WE AGREE. DEREGULATION WILL REPRESENT A SIGNIFICANT CHALLENGE TO OUR COMPANY BUT WE ENTHUSIASTICALLY EMBRACE THE OPPORTUNITY IT PROVIDES US TO FINALLY COMPETE UNFETTERED.

WHAT CAN CANADA EXPECT FROM DEREGULATION?
THE ANSWER REMAINS UNCLEAR BUT WE CAN GAIN SOME INSIGHT BY OBSERVING THE U.S. EXPERIMENT. CONCLUSIONS, HOWEVER, MUST BE DRAWN CAREFULLY BECAUSE OF THE DIFFERENCES IN OUR ECONOMY. I HOPE YOU SHARE MY VIEWS.

FIRST AND FOREMOST IS THE FACT THAT DEREGULATION WILL ASSURE, THAT COMPETITION WILL MANIFEST ITSELF NOT ONLY WITH INCREASED COMPETITION FROM OLD COMPETITORS, BUT ALSO, ALMOST CERTAINLY NEW COMPETITORS.

INSPITE OF THE FACT THAT WE ARE A CAPITAL INTENSIVE INDUSTRY, THERE ARE A FEW BARRIERS TO ENTRY. OUR ASSETS ARE VERY MOBILE AND HAVE GOOD RESALE VALUE. THAT MAKES THEM FINANCIABLE. ADD TO THAT THE FACT THAT ANYONE WHO LOST THEIR BAGS, THINKS THEY CAN AND SHOULD RUN AN AIRLINE AND YOU HAVE THE INCREDIENTS FOR A VERY COMPETITIVE SITUATION (INCIDENTALLY, IN THE AIRLINE BUSINESS WE REFER TO THIS COMPULSION ON THE PART OF THE OTHERWISE SENSIBLE BUSINESS PEOPLE TO START AIRLINES AS THE LEATHER HELMET, SILK SCARF SYNDROME).

ASIDE FROM THE NEW ENTRANTS, THERE WILL BE INCREASED COMPETITION BETWEEN THE MAJOR CARRIERS IN CANADA. IN THE BEGINNING OF 1986 THERE WAS ONLY ONE TRULY NATIONAL CARRIER IN OUR COUNTRY. AIR CANADA HAD OVER 60% OF THE MARKET. THIS HAS ALLOWED THEM TO PROVIDE THE ONLY TRAVEL NETWORK FROM COAST TO COAST.

THAT SITUATION HAS ALREADY CHANGED. BY JANUARY OF 1987, WHEN NORDAIR WILL BE FULLY MERGED INTO THE CANADIAN PACIFIC AIRLINE'S UMBRELLA, THERE WILL BE A SECOND NATIONAL NETWORK IN THE TRUEST FORM.

IT IS QUITE CLEAR THAT THE INDUSTRY WILL SERVE THE PUBLIC INTEREST FAR BETTER TOMORROW THAN IT HAS UNDER REGULATION:

- WITH MORE AIRLINES COMPETING FOR BUSINESS THE CONSUMER WILL HAVE THE FREEDOM OF CHOICE.

- THE SERVICE WILL BE IMPROVED IN TERMS OF AVAILABILITY AND CONVENIENCE.

- THE AIRLINES WILL BE FORCED TO BECOME MORE EFFICIENT WITH COSTS BEING PUSHED DOWN TOWARDS MARKET LEVELS. MANAGEMENT WILL BE FORCED TO EXPERIMENT AND IMPROVE THEIR SKILLS.

- THE REAL COST OF FLYING WILL CONTINUE TO FALL SUBSTANTIALLY, CONTINUING TO MAKE AIR TRAVEL ONE OF THE FEW CERTIFIED BARGAINS

- CROSS SUBSIDIZATION OF SHORT HAUL WITHIN ROUTES, TO LONG HAUL SERVICES WILL BE ENDED.

THE NEW ENTRANT, IN THIS QUOTE "EASY TO ENTER BUSINESS" CAN MAKE MONEY AT LOWER PRICES. WHY? BECAUSE A NEW ENTRANT WILL BUILD AN AIRLINE WITH LOWER COSTS. AFTER YEARS OF

REGULATION. ANY RESEMBLANCE BETWEEN OUR COST STRUCTURE IN THE MARKET FORCE IS PURELY INCIDENTAL. A NEW ENTRANT WILL TAKE PRICE LEADERSHIP IF ESTABLISHED AIRLINES STAND ON THE SIDELINES.

THIS WILL FORCE OUR INDUSTRY TO BE TRANSFORMED FROM A HIGH COST ONE TO A LOW COST ONE. FREEDOM TO MOVE DOMESTICALLY WILL ALSO MEAN FREEDOM TO FAIL EVEN FOR THE CROWN CORPORATION OR WE WON'T HAVE TRUE DEREGULATION.

FURTHERMORE, THE IMPACT OF FREEDOM TO MOVE GOES BEYOND THE CANADIAN BORDER INTO THE U.S. AND INTO THE INTERNATIONAL ENVIRONMENT AND MUST CLEARLY DICTATE THE GOVERNMENT POLICIES VIS A VIS INTERNATIONAL AVIATION. THE ISSUANCE OF LICENSES WILL FURTHER DICTATE THE EXTENT TO WHICH CANADA IS PREPARED TO NEGOTIATE AIR TRAFFIC RIGHTS WITH OTHER COUNTRIES. A NEW BALANCE WILL HAVE TO BE STRUCK BETWEEN FREEDOM TO MOVE AND BUILDING A CANADIAN INDUSTRY TO SURVIVE IN THE INTERNATIONAL MARKETPLACE. I EXPECT THE U.S. - CANADA BILATERAL WILL HAVE THE BIGGEST IMPACT ON THE CANADIAN AVIATION INDUSTRY IN THE NEXT FIVE YEARS.

THIS NEW ENVIRONMENT HAS, AND WILL PRESENT NEW CHALLENGES TO THE INDUSTRY PARTICIPANTS. IT IS A TIME OF INTROSPECTION; A TIME FOR EXAMINING STRENGTHS AND WEAKNESSES AND TIME FOR REDEFINING ONE'S FUTURE. AT CANADIAN PACIFIC AIRLINES, IT HAS BEEN A PARTICULARLY DIFFICULT TIME. IT HAS BEEN A TIME OF RECOGNIZING ALL WE HAVE BUILT WAS NOT ENOUGH TO ENSURE OUR SUCCESS IN THIS NEW ENVIRONMENT. IT HAS BEEN A TIME FOR RECOGNIZING THE IMPORTANCE OF HAVING A BROAD BASE COMPETITIVE NETWORK REACHING VIRTUALLY EVERY MAJOR COMMUNITY IN CANADA. THE NETWORK MUST REACH BEYOND THE CANADIAN BORDERS, IF ONE IS GOING TO ACCESS LARGE ENOUGH BASES OF TRAFFIC.

THEN IF THE COMPETITION STARTS OUT WITH A TREMENDOUS TRAFFIC ADVANTAGE, IT IS VERY DIFFICULT FOR ANY CARRIER TO HOPE TO BE ABLE TO MANAGE THE OTHER ELEMENTS OF PROFITABILITY EQUATION TO ALLOW FOR AN ADEQUATE RETURN. AT CANADIAN PACIFIC, THE PLAN IS SIMILAR TO THAT OF SOME OF THE U.S. CARRIERS. IN THEIR DEREGULATED ENVIRONMENT A CRITICAL MASS MUST BE REACHED IN ORDER TO SURVIVE. WITH THIS IN MIND, BUILDING A COMPETITIVE NETWORK THROUGHOUT THE COUNTRY AND A PLAN TO PROVIDE THE TRAVELLING PUBLIC WITH A REVITALIZED AND REENERGIZED COMPANY FOR THE 1990'S AND INTO NEXT CENTURY REPRESENTS THE FIRST MAJOR STRUCTURAL CHANGES IN THE CANADIAN INDUSTRY. THE OTHER STRUCTURAL CHANGES WILL PROBABLY BE BEST DESCRIBED BY MY FELLOW SPEAKERS ROBERT OBADIA OF NATIONAIRE WITH A NEW ENTRANT PERSPECTIVE AND PAUL MCNIGHT OF AIR ONTARIO WITH A COMMUTER OPERATOR PERSPECTIVE. THE RESULTS OF THE AMALGAMATION OF THE THREE

SEPARATE STRATEGIES WILL LEAD TO MORE CAPACITY, MORE DIRECT SERVICES, MORE PRODUCT OFFERINGS AND GREATER MARKET SEGMENTATION BY CARRIERS AS THEY DEVELOP NEW PRODUCTS AND SERVICES DESIGNED TO MEET THE BROADER MARKET NEEDS. THE "CUSTOMER" AND HIS SATISFACTION WILL BE THE BOTTOM LINE. TOMORROW'S CUSTOMERS WILL BE FAR MORE DISCRIMINATING IN SEEKING FULLER VALUE FOR THEIR PURCHASES; THERE IS ALREADY THIS DISTINCT AWARENESS FOR QUALITY AND PRICE.

AS WE ENTER THIS ERA OF THE GLOBAL MARKET, HIS TASTES HAVE BECOME MORE SOPHISTICATED AND LIFETIME CONCERNS WILL LEAD PEOPLE TO SEEK AND EXPECT PRODUCTS WHICH BEST MEET THEIR NEEDS AND EXPECTATIONS.

IT BECOMES EVIDENT THAT THE AIRLINE INDUSTRY WILL LOOK MORE LIKE A CONVENTIONAL CONSUMER PRODUCTS BUSINESS. "NEW AND IMPROVED" WILL BECOME THE OPERATIVE PHRASE. TRAVEL BONUS TYPE PROGRAMS, ATTACHE TYPE PRODUCTS, THE TOTAL TRAVEL EXPERIENCE, AND VACATION TOUR PRODUCTS ARE ONLY THE LEADING EDGE OF MARKET SEGMENTATION.

I WOULD ADD THAT A CARRIER SUCH AS CANADIAN PACIFIC, AND PERHAPS TO SOME EXTENT WARDAIR, AND PWA WILL GAIN SOME BY BUILDING ON THE RESPECTIVE COMPANIES' STRENGTHS. TO CANADIAN PACIFIC THIS INCLUDES OUTSTANDING PEOPLE, THE PRODUCT, THE ROUTE SYSTEM, THE EXISTING NETWORK AND AN EXTENSIVE REPUTATION IN HISTORY FOR TOP NOTCH SERVICE.

AS I MENTIONED EARLIER THE FABRIC OF THE CANADIAN GEOGRAPHY AND MARKETPLACE, THE CANADIAN AVIATION INDUSTRY MUST LOOK BEYOND THE BORDERS AND UNDERSTAND THE IMPACT OF FREEDOM TO MOVE. AS A RESULT, HERE IN THIS COUNTRY, WE CANNOT HAVE A DOMESTIC STRATEGY IN LIEU OF AN INTERNATIONAL ONE. FOR CANADIAN PACIFIC WITH ITS SIX MAJOR STRATEGIC THRUSTS, IT WILL ALLOW THE GRANT MCCONACHIE'S DREAM OF ESTABLISHING A REAL PRIVATE ENTERPRISE ALTERNATIVE FOR THE CANADIAN CONSUMER TO BE ACHIEVED.

IT INCLUDES;

- A STRENGTHENED DOMESTIC NETWORK
- A RESTRUCTURING OF THE INTERNATIONAL ROUTE SYSTEM
- A MORE EFFICIENT FLEET.
- A REDUCED COST BASE
- NEW MARKETING PROGRAMS
- A FINANCIAL STRATEGY TO SUBSTANTIALLY STRENGTHEN THE BALANCE SHEET
  AS A CORPORATE ENTITY.

I CANNOT REITERATE THE IMPORTANCE OF THE ABOVE NOT ONLY IN A PLANNING PERSPECTIVE, BUT ALSO IN A FORECASTING PERSPECTIVE. YOU ALL WELL KNOW HERE, THE SIZE AND DEPTH OF

THE U.S. MARKET PLACE. THIS SIZE AND DEPTH OF THE U.S. CARRIERS, MAKES THE CANADIAN EXPERIMENT VERY MINOR LEAGUE. IT IS FOR THIS REASON WE MUST BE VERY CAREFUL OF ITS IMPACT INTO THE INTERNATIONAL AREA. TO PUT IT INTO PERSPECTIVE, ALTHOUGH CANADIAN PACIFIC FLYS TO MORE COUNTRIES THAN UNITED AIRLINES, UNITED AIRLINES HAS MORE FLIGHTS IN DENVER IN ONE DAY THAN CANADIAN PACIFIC HAS IN ITS ENTIRE SYSTEM.

WHAT DOES THIS ALL MEAN TO THE INDUSTRY? MANY OF THE MOST IMPORTANT CHALLENGES FACING COMMERCIAL AVIATION NOW AND IN THE FUTURE STILL INVOLVE ISSUES OF GOVERNMENT REGULATION. IT IS NOT JUST THE INDUSTRY BUT GOVERNMENT ITSELF THAT MUST ADJUST TO THE NEW REGIME OF DEREGULATION. LET'S LOOK AT THREE SPECIFIC ISSUES; SAFETY, AIRPORT ACCESS AND GOVERNMENT FISCAL PRESSURES.

AIR SAFETY

AS HAS BEEN THE CASE IN THE U.S. SINCE DEREGULATION, BECAUSE OF THE ACCIDENTS OVERSEAS AND THE NORTH AMERICA TOURIST ATTACKS DIRECTED TO AIRCRAFT AND AIRLINE FACILITIES, AND A HEADLINE GRABBING UPWARD REVISION OF THE NUMBER OF NEAR MISSES, EVERY ASPECT OF AVIATION OPERATIONS ARE RIPE FOR SCRUTINY AND CRITICISM. THE ISSUE WILL CONTINUE TO RECEIVE ATTENTION FROM THE PRESS AND THE PUBLIC.

OF COURSE, WHILE YOU AND I WELL KNOW, IT IS A LOT SAFER TO BE IN AN AIRPLANE THAN IN A CAR, THE INDUSTRY MUST ENSURE THAT AIR TRAVEL IS NOT ALLEGED TO BE UNSAFE BECAUSE OF FARE AND ROUTE DEREGULATION. WE NOTE THAT AS WE BECOME A SERVICE INDUSTRY, A CUSTOMER DRIVEN INDUSTRY, THAT IT IS THE PERCEPTIONS OF THE CUSTOMER AND NOT OUR PERCEPTIONS THAT MATTER. THE PUBLIC MUST HAVE FULL CONFIDENCE IN THE SERVICE THAT IS BEING OFFERED. VERY MUCH, THE INDUSTRY MUST WORK WITH GOVERNMENT TO ENSURE THAT THE SAFETY RECORDS AND SAFETY PROGRAMS ARE NOT JUST MORALLY RIGHT, BUT GOOD BUSINESS.

AIRPORT AND AIRWAY RESTRICTIONS

I EXPECT THAT THE AIRPORT AND AIRWAY RESTRICTIONS THAT CANADA CURRENTLY FACES, IN AT LEAST EIGHT MAJOR CITIES AND PERHAPS MORE, WILL PRESENT SIGNIFICANT OBSTACLES FOR THE GROWTH OF THE INDUSTRY. NEED I MENTION THE PROBLEMS AT TORONTO, OTTAWA OR VANCOUVER THESE DAYS. UNFORTUNATELY THERE DOESN'T SEEM TO BE A PLAN TO ALLEVIATE THIS, EVEN WITH A STATUS QUO INDUSTRY. RATHER THAN ACHIEVING AN EXPANSION OF SCARCER AIRPORT CAPACITY, THE SYSTEM SEEMS TO BE MOVING IN THE OPPOSITE DIRECTION. THERE IS ONLY ONE REAL CURE.

THE GOVERNMENT MUST EXPAND THE AIR TRAFFIC SYSTEM BOTH IN TERMS OF THE FACILITIES TO HANDLE AIRCRAFT MOVEMENTS ON THE GROUND AND IN THE AIR. I AM SURE TECHNOLOGY CAN IMPROVE THINGS TO A VERY LARGE EXTENT IN THE MAJOR CENTRES IN CANADA. AIRCRAFT MOVEMENTS HERE ARE NOT AS DENSE AS THOSE IN EUROPE AND IN THE UNITED STATES. MORE SOPHISTICATED AIR TRAFFIC CONTROL SYSTEMS WOULD OBVIOUSLY HAVE HAD TO BE IMPLEMENTED IN THESE COUNTRIES. ARTIFICIAL BARRIERS THAT WHERE PART OF THE INTERNATIONAL POLICY AREA, SUCH AS THE CAP ON TORONTO AIRPORT, ALLOWING NEW INTERNATIONAL ENTRANTS ARE RESTRICTING OF AIRLINE OPERATIONS IN THE AIR AND ON THE GROUND THAT BECOME COMPLETELY INCONSISTENT AND INCOMPATIBLE WITH AN "OPEN-SKIES" CONCEPT. FURTHERMORE IF CANADA WANTS ACCESS TO MORE PRIME INTERNATIONAL MARKETS
ACCESS TO ITS OWN PRIME MARKETS MUST BE AVAILABLE.

FISCAL PRESSURES ON GOVERNMENT

THIS IS THE THIRD AND OVERRIDING GOVERNMENTAL FACTOR AFFECTING CONSTRAINTS ON COMMERCIAL AVIATION AND COULD, AT THE SAME TIME, MAKE IT EXCEEDINGLY DIFFICULT TO ADDRESS THE PROBLEMS THAT HAVE ALREADY BEEN MENTIONED. NO DOUBT, THE NATIONAL TASK FORCE THAT IS LOOKING INTO THE PRIVATIZATION OF AIRPORTS AND THE CONCLUSIONS THAT HAVE BEEN TABLED TODATE IT IS THE MOST RECENT DEMONSTRATION OF THEIR DILEMNA. GOVERNMENT FINANCIAL PRESSURES DICTATE THE EXTENT TO WHICH THE TRANSPORTATION REVENUES WILL BE REALIZED.

INTERNATIONAL AVIATION

I WILL BE QUITE REMISS IF I DID NOT TALK ABOUT TWO OTHER AREAS OF CONCERN OF MAJOR IMPACT IN THE GROWTH OF THE CANADIAN COMMERCIAL AVIATION INDUSTRY. ONE IS THE FREE TRADE NEGOTIATIONS WITH THE U.S. THERE HAS BEEN MUCH DISCUSSION AND MUCH TALK WITHIN THE CANADIAN INDUSTRY AS TO WHAT STEPS MUST BE TAKEN TO REDRESS THE CURRENT IMBALANCE THAT OCCURS BETWEEN CANADA AND THE U.S., WHICH FROM A CARRIER PERSPECTIVE IS VERY MUCH IN FAVOUR OF THE U.S. AIRLINES. PRECLEARANCE FROM THE CANADIAN AIRPORTS MAKES THE U.S. CARRIER'S ACCESS TO CANADA A VERY SIMPLE EXTENSION OF THEIR OWN DOMESTIC/U.S. SYSTEM. AT THE SAME TIME, THERE HAS BEEN NO RECIPROCAL APPROACH THAT WOULD HAVE THE SAME IMPACT FOR CANADIAN CARRIERS AT THE U.S. GATEWAY. THERE ARE ADVOCATES OF GIVING CANADIAN CARRIERS CABOTAGE RIGHTS, SO THE CANADIAN CARRIERS WILL BE UNFETTERED TO COMPETE IN SUCH ROUTES AS NEW YORK - LOS ANGELES AND CHICAGO - LOS ANGELES UP AGAINST THE LIKES OF NORTHWEST, UNITED, DELTA AND, OH YES, AMERICAN AIRLINES. NOW GENTLEMEN, WHAT DO YOU THINK THE CHANCES ARE OF A CANADIAN CARRIER ENTERING ONE OF THESE MEGA MARKETS AGAINST MEGA CARRIERS AND BEING SUCCESSFUL. I CANNOT BEGIN TO DESCRIBE THE SIZE OF THE INVESTMENT THAT IT WILL TAKE TO

BECOME A HOUSEHOLD NAME IN CHICAGO. FURTHERMORE, CABOTAGE FOR CANADIAN CARRIERS IN THE U.S. COULD LEAD TO CABOTAGE RIGHTS FOR U.S. CARRIERS IN CANADA. NOW LET OUR IMAGINATION RUN ADRIFT FOR A MOMENT, THE CONSUMER COULD HAVE THE CHOICE IN 1990 OF AMERICAN, TWA, NORTHWEST AND OH "IS THERE A CANADIAN CARRIER FROM TORONTO OR VANCOUVER".

OBVIOUSLY, I BELIEVE MY SENTIMENTS HERE CAN BE WELL UNDERSTOOD, RECIPROCAL CABOTAGE RIGHTS DO NOT SEEM LIKE A GOOD MEANS TO AN END WITHIN FREE TRADE IN CANADA OR THE U.S. I BELIEVE WE CANADIANS MUST ACCEPT THE GEOGRAPHY THE WAY IT IS, AND CONTINUE THE MORE TYPICAL EXCHANGE OF TRAFFIC RIGHTS BETWEEN CANADA AND THE U.S., LINKING MORE CITY PAIRS; NORTH, SOUTH AND TRANSCONTINENTALLY.

HOWEVER, IT DOES BECOME THE CANADIAN OPPORTUNITY, TO TAKE ADVANTAGE OF THE CANADIAN GEOGRAPHY. MANITOBANS CAN BE CONVINCED TO FLY THROUGH CHICAGO IN FEBRUARY TO GO TO FLORIDA. IS THERE ANY PARTICULAR REASON WHY WE CAN'T CONVINCE NEWYORKERS TO FLY THROUGH TORONTO ON THEIR WAY TO TOKYO? AS ONE OF THE EXPORTERS OF FREE TRADE, DR. WASSENBERG OF THE NETHERLANDS ONCE SAID, "SIXTH FREEDOM'S DO REPRESENT THE GLOBAL MARKETPLACE AND THE COMMON MARKET - SIXTH FREEDOM RIGHTS ARE OPPORTUNITIES AND ARE NOT NEGOTIABLE". AGAIN, THIS OPPORTUNITY CANNOT BE A ONE CARRIER PERSPECTIVE BUT MUST BE CANADIAN INDUSTRY ONE AND EVENTUALLY A CANADIAN POLICY ONE ON TRANSBORDER ROUTES. IF THIS IS NOT ACHIEVED, THE INDUSTRY WILL NOT BENEFIT. RECOGNIZING THE SIXTH FREEDOM OPPORTUNITY AND THE CANADIAN GEOGRAPHY, CANADIAN CARRIERS CAN TAP OTHER MARKETS BECAUSE OF GEOGRAPHY; TRAVEL TIME TO WORLD MARKETS VIA CANADA IS COMPETITIVE WITH THOSE ON A MORE DIRECT ROUTING BETWEEN THIRD AND FOURTH COUNTRIES TERRITORIES. HOWEVER, THE GOVERNMENT MUST BACK UP THIS INDUSTRY VIEW WITH GOVERNMENT LEGISLATION TO PROVIDE FACILITIES AND SERVICES ALLOWING THE CANADIAN AVIATION INDUSTRY TO ACHIEVE ITS GOALS.

GENTLEMEN, FACILITIES SUCH AS (SCHIPHOL AIRPORT) MUST BE EXPORTED TO CANADA IF ONE IS GOING TO HAVE INTRANSIT FACILITIES THAT CAN ATTRACT WORLD TRAVELLERS. AS YOU CAN SEE, THIS MEANS A REQUIREMENT TO CHANGES ON EVERYTHING FROM RIGHTS AND POWERS OF INDIVIDUALS TO TAX REFORM ON IMPORT AND EXPORT DUTIES OF CERTAIN ARTICLES.

AGAIN, THIS FUTURE COURSE OF THE CANADIAN AVIATION INDUSTRY WILL CROSS OVER INTO THE OTHER INTERNATIONAL BOUNDARIES, HAVING ANOTHER MORE IMPORTANT BEARING ON THE OUTCOME OF THIS SIDE OF THE CANADIAN AVIATION INDUSTRY; FOREIGN POLICY. THE EMERGENCE OF THE PACIFIC RIM, THE ECONOMIC GROWTH AREA FOR THE LATE 80'S AND 90'S IS PROBABLY ONE OF

THE BEST EXAMPLES TO SHOW WHAT CHALLENGES WE FACE. THE ASIANS HAVE SINGLE-MINDEDLY TAKEN AIR TRANSPORTATION TO NEW HEIGHTS BOTH ON THE SERVICE SIDE AND ON THE UNIT COST SIDE. THE KOREANS HAVE NOT ONLY DONE IT TO THE AUTOMOBILE INDUSTRY BUT THEY HAVE ALSO DONE IT TO THE AIRLINE INDUSTRY. NO-ONE CAN POSSIBLY MATCH THEIR COST PRICE VALUE RATIO. THIS MUST BE RECOGNIZED IN INTERNATIONAL TRADE AGREEMENTS AND WHERE AIR TREATIES ARE NEGOTIATED. A PREMATURE SWING OF THE PENDULUM TO AN OPEN SKIES POLICY INTERNATIONALLY, OR PREMATURE DUAL DESIGNATION IS OF FAR GREATER BENEFIT TO THE FOREIGN CARRIERS THAN IT WILL TO THE CANADIAN CARRIERS. POLICY MAKERS MUST ENSURE THAT MARKET SIZE, FREQUENCY FOR AIR TRAVEL IS THERE BEFORE AIR TREATIES CAN BE SUCCESSFULLY IMPLEMENTED AND MANAGED.
CANADA MUST ACCEPT THE FACT THAT WE HAVE HIGHER OPERATING COSTS, DUE TO OUR HIGHER STANDARD OF LIVING ETC., THAN SOME OF THE COUNTRIES THAT WE TRADE WITH, AND WITHOUT BEING OVER-PROTECTIVE, MUST ENSURE A PATH OR ORDERLY GROWTH FOR THE PROSPERITY FOR THE CANADIAN AVIATION INDUSTRY. NOR, SHOULD I LEAVE ALL THE UNCERTAINTY IN THE HANDS OF GOVERNMENT AND POLICY ISSUES. WHAT ABOUT THE BUSINESS MANAGER?

WITH ALL THIS TALK ABOUT THE OPPORTUNITIES OF NEW ENTRANTS AND COMMUTER OPERATORS, THE MANAGER OF THE 80'S AND 90'S MUST BE WELL ROUNDED BUSINESSMEN. IT IS ALL TOO EASY IN THIS BUSINESS, THAT WHEN FACED WITH COMPETITION, THE FIRST REACTION IS TO CUT PRICE IN AN EFFORT TO MAINTAIN A SHARE OF THE MARKET. THE RECORD OF THOSE CARRIERS WHO TURN TO FARE CUTTING TO SAVE THEIR AIRLINE HAS BEEN DISMAL TO SAY THE LEAST. ONE OF THE MAJOR PROBLEMS IS THAT MANY AIRLINES DO NOT HAVE A HANDLE ON WHAT IT COSTS TO PRODUCE THE PRODUCT THEY SELL. WITHOUT FULL KNOWLEDGE OF WHAT IT COST TO FLY EACH DAILY FLIGHT SEGMENT, IT IS IMPOSSIBLE TO PRICE THE PRODUCT PROPERLY AND TO SET NEW TARGETS THAT WILL PRODUCE AN ACCEPTABLE PROFIT. THE MOST RECENT U.S. EXPERIENCE OF PEOPLE'S, FRONTIER, BRANIFF AND EASTERN TO NAME A FEW, SHOW YOU WHAT A CASUALTY LIST COULD LOOK LIKE IF THE BUSINESS IS NOT MANAGED PROPERLY. NOT THAT THE BUSINESS MANAGER IS ALONE IN BEING ABLE TO DEAL WITH HIS ECONOMICS. IT ALSO BECOMES VERY MUCH A PEOPLE MANAGEMENT OPPORTUNITY. THANKS TO THE MATURE ATTITUDE SHOWN BY THE UNIONS IN INDUSTRY, NEW CONTRACTS ARE GETTING SIGNED WITHOUT WORK STOPPAGE. I BELIEVE THE UNION EXECUTIVES UNDERSTAND THAT CARRIERS NOW MUST REDUCE COSTS TO SURVIVE. A SOLID UNION/MANAGEMENT RELATIONSHIP WILL ALLOW FOR THE ADDITION OF NEW EMPLOYEES INTO COMPANIES AND AT THE SAME TIME REDUCE THE UNIT COST BECAUSE OF THE LOWER RATES OF PAY THESE PEOPLE BRING WITH THEM.

THE ADVANTAGE OF THE U.S. STARTING THE DEREGULATION MUCH SOONER THAN CANADA IS FURTHER MAGNIFIED BY THE MUCH SMALLER

MARKET PLACE WE HAVE THE OUTCOME IN CANADA WILL NOT BE DISSIMILAR TO THAT IN THE U.S. WITH THE EMERGENCE OF THE MEGA CARRIERS. THE QUESTION FOR THE CANADIAN AVIATION INDUSTRY IS WHAT DOES THE SIZE, CRITICAL MASS, THE TRAVEL PROPENSITY WITHIN THIS COUNTRY, AND TO AND FROM INTERNATIONAL MARKET PLACES SUPPORT IN THE PRIVATE SECTOR; ONE, TWO OR THREE NATIONAL SYSTEMS PLUS SOME BOUTIQUE CARRIERS. FURTHERMORE, HOW MANY FULLY INTEGRATED NETWORKS, WITH DIVERSIFIED AND CONTROLLED "COMMUTER CARRIERS" WILL THERE BE.

WHAT IS FOREMOST IN MY MIND AND MY COLLEAGUES MINDS AT CANADIAN PACIFIC, IS ONE THAT THIS MUST BE A HEALTHY INDUSTRY FINANCIALLY, AND AT THE SAME TIME GIVING THE CUSTOMER NEW AND IMPROVED SERVICE. JUST AS WE HAVE IN THE GROCERY BUSINESS IN THIS COUNTRY, LESS BRANDS ON THE SHELF THAN OUR COUNTERPARTS IN THE U.S.A. I BELIEVE THE INDUSTRY, AVIATION THAT IS, MUST ACCEPT LESS BRANDS IN THE DOMESTIC SKIES IF IT IS GOING TO REMAIN HEALTHY. THE END RESULT OF THIS TOTAL EVOLUTION WILL BE LESS MAJOR CARRIERS IN THIS COUNTRY TOMORROW THAN THERE ARE TODAY WITH THE PRIVATE SECTOR HAVING A BIGGER AND STRONGER SHARE OF THE INDUSTRY AS A WHOLE. CANADIAN PACIFIC INTENDS TO BE A PART OF THAT PLAN, A SUCCESSFUL PLAYER IN THAT PLAN AND TRULY CANADA'S PRIVATE ENTERPRISE AIR TRANSPORTATION NETWORK, AND CANADA'S FLAG CARRIER IN THE PACIFIC.

NEW ENTRANT

Robert Obadia

President and Founder of Nationair

Biographical Highlights:

Mr. Obadia began his experience in the aviation industry with Air France at Orly in 1966 as a student-worker in the Aircraft Maintenance Division. Following this he worked for Royal Air Maroc in Casablanca and for Quebecair where he began as Director of Marketing (scheduled services), then became Vice-President of Marketing, responsible for all sales activities in the company.

In 1980 he established an aeronautical consulting company known as Avia Consul Inc. This company undertook several studies on behalf of air carriers, the Government of Canada, the Post Office as well as the Parliament of Canada.

In 1984 Nationair began operations with two DC8s and 120 employees. In 1986/87 the company had grown to seven DC8s and a staff of 360.

Mr. Obadia has an electronics engineer's diploma from the École nationale supérieure d'Electronique in Genoble, France, as well as various certificates for advanced studies in Physics, Chemistry and Mathematics. He also has a first year certificate from studies in Law and Political Economy, and training in administration (management, accounting, finance, marketing, corporate planning, etc.) - mainly from the École des hautes études commerciales in Montréal.

AIR CARRIER OUTLOOK - NEW ENTRANT

Robert Obadia, President, Nationair

I am very pleased and very proud to be here today as what we call a new entrant and I can tell you something that one of the greatest pleasures in life is to exist when we are not suppose to exist. I would be remiss at this point not to pay tribute to the prophets for what they do best. Be wrong. I want to tell you right away that I am not going to talk about deregulation. I think that the subject has been beaten to death and in the world of aviation, especially airline people, talks about deregulation have become the number one subject and even have surpassed sex. Although in some cases, the vocabulary may seem strangely alike, for example, I am sure you heard about deep penetration, pre-mature withdrawal, and next month there will be an ATAC meeting and I bet you that what those attending will do most of the time will compare the size of their equipment.

Well, Nation Air is a charter carrier, based in Mirabel, we operate seven DC-8 aircraft, carry about 400,000 passengers, give jobs to about 370 people and we are looking to the future with a lot of enthusiasm and optimism. What I would like to do today is to share with you some of the masochistic pleasures we have experienced in launching a carrier. I won't go through all the details because you may like it, but I am simply going to summarize in two parts: 1) the main steps and the pitfalls in building a carrier; and the other one will be something that you may not read in the text books and that I will call the dark side of competition. Now, how does it all start? You wake up one morning, you are fed up with everything, and you are faced with the most natural choice that was offered to man and woman since the dawn of man kind, which is either suicide or create an airline. Since you are not fully awake you decide to create an airline. So the first thing to do there, it used to be in my time, which was five years ago, it will change in the future, what you have to do is get a licence. Very easy. You put together a bunch of lies, you call it an application, and you ship it to the CTC. Now, if you don't feel good enough, you hire a lawyer. He will do it for you. I must say that I had many friends at the CTC and as a mark of friendship, the first thing they did was to reject my application, to protect me from competition. Also, again in those days, it was very difficult to give birth to an airline. Birth control was very effective and exercised by the Canadian Transport

Commission, in every sort of fashion and the most common fashion was, to control the length of the pregnancy. In the case of Nation Air, it was about four years. But in the end, in September 1983 and I filed the application in January 1980, I got a call from the CTC and they told me it was a boy. So, I called then one of my best friends to share the good news with him and his reply was very typical of the attitudes that I was to encounter later on was "HA! HA! HA! They screwed you." Anyway, so there we are, we have a piece of paper called a decision by the CTC. What do you do with it. Well, if you decide to go ahead with it, the first step is to look for funds. In those days, the banks were all hit by an acute case of BS with the Braniff Syndrome. Because in those days the only thing airlines could do is fall from the sky. You have the Braniff and you have the Air Florida and you had others and in our part of the country, we had also another airline on social welfare. So the environment was not very conducive to the banks opening their purses. Basically the question was, If all these guys don't make it, how come we are going to make it? and if anything, the more you explain to them how you are going to make it, the less they believe you and eventually, the banks did not participate in Nation Air in any shape or form. Once you have done that, suppose you did get the money, and we did, then you have to look for an aircraft. There was a time around 1981 or 1982, that was not the problem, if you recall, the airlines had jointly bought the state called Arizona and to protect the sand from the scorching heat of the sun, they decided to cover it with airplanes. But when we arrived on the scene, it was in early 1984, the airplanes had evaporated. It was very difficult to get airplanes. Eventually we had to settle for airplanes which were not our first choice and we got two airplanes. Since we were very lucky, the company that we bought the airplanes from went bankrupt, but that's all right we gave them to a company to prepare for the Transport Canada seat check. Then the maintenance company went bankrupt too. So we are bad news. Eventually the airplanes were delivered and the second airplane was delivered on the day before the first flight and we spent the night changing seat covers, I mean we the pilots, the flight attendants, myself and so forth and on December 8, 1984 we took off.

Once you have the airplane, then you have to find insurance. It is tough today, but it was not easier 2 or 3 years ago and the more we grow the tougher it will be. Some people say now that the new regulators of the airline industry worldwide are the insurers and I believe it. Then also you have to hire employees. It was not easy because why would somebody leave a steady job for what people called then "a dream that would never take off". We understood that. So it was not easy to get the right kind of people because again in this industry, we may have nice airplanes, we may have good advertising campaigns and you may have all you want. But, you need to have the right people to manage the company. People who believe in it. People who have faith. People who have enthusiasm. And that

is difficult to find because most guys wherever they are are difficult to move. Then you have to have a market. It was particularly difficult because as a charter carrier you have to market your services 6 to 9 months before the time of the first flight. We were quite unique then, remember around May 1984 when we were marketing the Nation Air, we were the only airline in Canada without an airplane. Considering the over-capacity on the market, it was quite a feat for us to do it. But we managed again to do it. Then we must have an operating certificate. I must say that in all fairness to Transport Canada they are tough but fair. We complied with all of their requirements and again at the last minute, on the day before the first flight, we got our operating certificate and on December 19, we took off. So this in a nutshell the steps we had to go through and which every future new entrant will have to go through. So now we are flying and we are in the world of competition and the world of charter is more competitive than any other market that you can think about. For example, on Montreal to Paris last summer there were seven carriers. Even from Montreal to Toronto there are not seven carriers and the yields are something else.

When you talk about competition there are two things which I want to speak about which are not part of the text books on competition and marketing. But which are the elements of the real life; the elements that any new entrant will face or will have to face: 1) is the question of credibility and the attack on credibility of your competitors and the other one is that you will always have to fight against deeper pockets. Talking about credibility, I was amazed with the extent to which our competitors knew about us. In fact, they knew more about Nation Air than we did about Nation Air, and in some cases they knew more about us than their own airline. For example, they knew that we would never get the licence, never. I did not know it. They knew that we were never going to get the funds. I mean our banker had the money, but he did not know it. They knew that we were never going to have any airplanes. The mechanics painting our name of the airplane, our logo, didn't know it, but our competitors knew that we would not have any airplanes. They knew that we would not get the market. We had all the contracts signed but they knew that we would not get the market and when we took off, they knew we would not last more than one winter. Yet, from the first months of operation we were profitable. So what it all boils down to is that as a new carrier, necessarily you are not a member of the club. There is a club of established carriers, a club which has developed its own rules and also its own walls over the years and they simply do not accept to see a newcomer. In some cases they take it personally, but that is the way it is. When you are entering a very competitive market as we were at Nation Air, credibility is important. Fortunately enough for us, the people making up Nation Air had their own personal credibility to put against what was being said by our competitors and eventually this credibility prevailed.

One of our competitors in particular, after having said that we would never take off and was so convinced of it, that they bought an airplane, to take over the business that we were not going to be able to carry because we would not take off. That is authentic; it has been confirmed by one of their key officers. Now lets talk about another side of competition, fighting the deeper pocket.

A new entrant in essence is a venture capitalist. You do not start into this business just because you want to fly an airplane or because you dreamed about airplanes. You do it because it is a business. Because you want to achieve a profit. That is where I'm going to make some pretty nasty comments. The kind of competition you have to face is this. You are looking for profits. Your competitors are looking for market shares. Profits are the name of the game as far as you are concerned, as far as all your organization is concerned. In some other cases in the competition keeping a job is the name of the game. If you fail in having a profitable operation, at the end there is the death penalty. For you competition at the end there is a press conference to explain why. These are the realities of a new entrant. This is also understandable because you have to understand how it has worked in the past and that the environment of regulation is going to change and is changing rapidly. But the scenario was pretty standard. The VP marketing was aiming at increasing sales. Profitable or not that was not the objective. The President was planning for the year 2000. The Board Members were planning for the next trip to Singapore, complimentary trip of course, and therefore not worrying about what happened to the rest of the airline, and the shareholders were sleeping. Now in this environment, it is not unusual and it is not surprising that profitablity has not been better than what has been so far. Deregulation will certainly bring a new perspective to the way airlines are managed and all to the good. I have been reflecting upon this subject of profitability for quite awhile. How come airlines are not more profitable? Someone would say that profit is not necessarily the first objective. But why don't we make it the first objective. I am proposing here today, why don't we create a contest in Canada for the most profitable airline. That contest could be administered by ATAC and every year on the occasion of the annual meeting of ATAC, the carriers which have shown the best performance would be rewarded. So that instead of fighting for loss or fighting market shares which bring losses, carriers would be fighting for profits and since profits are a direct reflection of efficiency, in the end the public would benefit. What is the outlook now for a new entrant? I would say that the sky is overcast with a few breaks. The new entrants certainly have certain things in their favour. Their enthusiasm, their creativity and the fact that they are "lean". But they have to face tough competition, because their competitors have the money, have the technical infrastructure, and have the credibility. This is why I am saying that I am not expecting

in Canada to see the number of new entrants that we saw in the States, but I think that there is room for new entrants in Canada. Profitable new entrants, who will develop not necessarily to be sold to major carriers, but to develop for themselves. In conclusion, I would say founding a new carrier is a mission "possible", but!

COMMUTER OPERATOR

Paul D. McKnight

Director of Marketing and Planning,
Air Ontario Limited

Biographical Highlights:

Mr. McKnight joined Air Ontario in 1975 and is now responsible for both the commercial (sales and marketing) and planning (scheduling and route development) activity for the airline. Prior to joining Air Ontario, Mr. McKnight was employed in the field of Operations Research with Canadian National Railways, Financial Research with the Royal Trust Company, and Airport Planning with Transport Canada. Mr. McKnight holds a degree in Industrial Engineering from the University of Toronto and earned a master's degree in Business Administration from the University of Western Ontario.

SURVIVAL OF THE TURBOPROP CARRIER IN CANADA

Paul D. McKnight
Director of Marketing and Planning
Air Ontario

Introduction

For the first six years after passage of the Airline Deregulation Act in the United States, Canadian carriers had the luxury of watching from the grandstand while their counterparts south of the border went through the now-legendary pattern. Massive proliferation of routes by existing carriers and establishment of many new carriers together lead to fare wars and attempts at 'niche' marketing. The requisite cost cutting which followed created both considerable labour strife and a rash of carrier bankruptcies. The continuing financial pressures have caused the entire industry to enter a consolidation phase, with numerous mergers and buy-outs, not all of which have been friendly.

In particular, the smaller Canadian carriers drooled with envy, both at the opportunities which resulted for smaller U.S. carriers as major jet carriers withdrew from numerous markets, and at the new flexibility that unrestricted market entry provided.

Meanwhile, in Canada, those smaller carriers were facing severe restrictions on obtaining new routes to fly, larger aircraft to operate, and innovative fare mechanisms to offer to their customers. In addition, they were operating within a domestic market that is one-tenth the size of that in the United States, a linear population pattern highly concentrated in relatively few major centers, an industry dominated by two major airlines, and a Canada/United States border that, for all the opportunities it presented to smaller Canadian carriers, might as well have been the Berlin Wall.

"The Winds of Change"

In the past two years, however, the winds of change have started blowing in Canada. While the usual five-year lag in our adoption of American actions held true in this case as well, it took large volumes of Canadians travelling by road to fly out of a few United States border cities to finally spur our government into taking action.

A series of public hearings into the desirability of loosening the regulatory system for airlines went across the country in

the winter of 1984-85. From the numerous presentations and the debate which followed came the 'Freedom to Move' document in July of 1985. Despite the absence of any legislative changes, the Air Transport Committee was strongly urged to lean heavily in the direction of encouraging competition on routes.

Our government also worked out two significant agreements with the United States: Firstly, the identification and opening wide to transborder operations of "underutilized" airports allowed nearly unrestricted operation to/from Mirabel and San Jose, on an experimental basis. Secondly, and of monumental significance to smaller carriers, an agreement was reached which actually encouraged carriers operating aircraft of less than 60 seats to apply for transborder routes under 400 miles in length between cities not now served and which meet certain population criteria. More recently, our government negotiators, in consultation with the Canadian carriers, have put forth to their American counterparts a proposal to open the border for operation by carriers of both countries, with the condition that cabotage be allowed. While this proposal thus far has met rejection from the United States, it epitomizes the extent to which the Canadian regulatory posture has changed in two short years.

Even more significant than this recent shift in attitude by the regulators, however, are the moves made by the major Canadian airlines during that same two years.

Air Canada has actively pursued its new mandate "to operate in contemplation of profit". Its Aeroplan offering and the cancellation of joint fares with CP Air on parallel routes are attempts to encourage frequent (business) travellers to use Air Canada for all of their air transportation needs. The national airline has invested in minority shares of Air Nova (49%) in the Atlantic region and Air Ontario (24.5%) in central Canada. And with a view to enhancing its profitability in preparation for "privatization", Air Canada has announced withdrawal from money-losing operations to cities such as Houston, Dallas, London (Ont.) and Sault Ste. Marie, with more cutbacks rumoured in 1987. Meanshile, a recent internal reorganization has focussed on the carrier's transborder and international operations which must necessarily be the source of future growth.

Canadian Pacific has undergone massive change in the past few years. A decision to develop its route network in a "hub and spoke" pattern, with major hubs in Vancouver and Toronto, prompted its first commercial agreement with Air BC between Victoria and Vancouver. Since then its purchase of three regional carriers (Eastern Provincial, Nordair and, indirectly, Quebecair) and direct involvement in several smaller carriers (Norcanair, Inter City, Nordair Metro and Air Atlantic) has created for it a truly national network, competitive with Air Canada. Taken together with its very aggressive marketing thrust, a crisp new corporate identity and consolidation of its aircraft

fleet into two types (Boeing 737 and DC-10), these moves have significantly altered the airline "balance of power" in Canada.

Pacific Western has recently structured a close relationship with Time Air, withdrawing from serving numerous points in Alberta and the interior of British Columbia in favour of the turboprop carrier. PWA is generally regarded as being aligned with the Air Canada "camp" although the actual role it is to play in that relationship remains to be seen. Yet to be revealed also, is the airline's plan to use a large pool of cash generated by a recent sale/leaseback of its fleet of Boeing 737 aircraft. Pacific Western appears to be positioning itself for a major move of some nature.

Wardair has won its long-sought right to operate as a scheduled airline and has commenced scheduled service both on trans-continental and trans-Atlantic routes. This has involved considerable talk of acquiring smaller jet aircraft than those now operated, and substantial changes to its internal systems: reservation system, fares, ticketing and approach to interlining.

Against this backdrop of big moves by the major jet carriers, what is to become of the many smaller Canadian carriers? Is there a future for the scheduled operater of propeller aircraft in Canada? And what will determine which operators will survive and prosper, and which ones will fail to meet the challenge?

From Avoidance to Alliance

Smaller (i.e. non-jet) carriers in Canada have traditionally served local markets close to their bases of operations. They have tended to live on the scraps left by the major carriers: serving the major carrier markets at off-peak times, or seeking out and developing markets not served by the major carriers at all. There was no question of the smaller carriers competing with the majors; rather, the smaller carriers were forced to simply exploit any gaps in the major carriers' services.

As a result, life for the smaller carriers has been meager and difficult. If a market showed much traffic potential at all, a major carrier would serve it with a stop on a longer flight. Consequently, the smaller carriers learned to live on limited opportunities in the marketplace, usually using older, inefficient aircraft, unable to attract financing for expansion, with poor-to-mediocre passenger appeal and vulnerable to actions by the major carriers. There was certainly little to serve as a basis for future planning.

The past two years, however, have seen a marked shift in focus for the smaller carriers. The deregulation model in the United States, sounds of regulatory reform in Canada and a growing recognition of their potential by major carrier managements have

together suggested a new role for the smaller carrier: as a partner with a major carrier (i.e. if you can't beat 'em, join 'em).

With the two largest carriers declaring what amounts to competitive war with each other, smaller carriers have opted to join one of the armies. This phenomenon has created entirely different relationships than existed even twelve months ago: the major carrier in each case is seeking ways that the smaller carrier can help it do its job more effectively, and the smaller carrier is quickly adapting its operations to complement its "big brother".

Serving as a basis for this rapid change in relationships is the fact that an alliance of two carriers has significant benefits for both. Those benefits include:

- enhanced identity
- wider exposure in the marketplace
- increased traffic volume
- positive passenger reaction
- route development
- better use of computerized reservations system technology
- synergies in airport handling
- greater access to capital financing

A more detailed outline of how both the smaller carrier and the major carrier benefit from an alliance relationship is laid out in Table 1.

Potential Pitfalls

It is too soon in the development of carrier alliances in Canada to assess their effectiveness or to predict their future. But it is important, at this point, to note that the alliance strategy has potential for not only benefit but also problems. Some likely ones are laid out below:

1. A new element of vulnerability.
   Going from a full interline system, where a smaller carrier was exchanging traffic with all other carriers, to a system whereby the smaller carrier is working within only one of the two major streams of traffic, means that the smaller carrier is now tied to the wishes, the marketing thrust and, ultimately, the success or lack thereof of the major carrier.

2. Limitations to route development.
   There is a finite number of routes that the major carrier will conceivably want to, and be able to, withdraw from in favour of the smaller carrier. What happens after that? The smaller carrier's growth plateaus. Then the alliance can be a smothering factor, with the major carrier placing

TABLE 1

BENEFITS OF ALLIANCE RELATIONSHIP

Benefit	For Smaller Carrier	For Major Carrier
Identity	- Credibility by association, through shared designator, common airport facilities.	- Enhanced image, due to expanded geographical sphere of influence.
Exposure	- Product display in major carrier's reservations system, timetable, advertising.	- Presence (visiblity) in off-line markets, through shared designator, smaller carrier's timetable and advertising.
Traffic	- Increased volume, due both to channeling of traffic connecting with major carrier and to access to new markets.	- Feed traffic secured from smaller carrier's markets, through joint fares and frequent flyer program.
Passenger Reaction	- Increased confidence in safety/comfort of turboprop equipment.	- Passengers enjoy most of major carrier's service features when travelling to smaller carrier's points.
Route Development	- Access to routes better served by higher frequency with smaller aircraft; consequently, major carrier reduces service or withdraws.	- Allows for deployment of equipment to denser longer-haul routes.
Computerized Reservations System (CRS) Technology	- Schedule changes, inventory controls, seat selection, fare display/quotation, automated boarding passes, connecting itineraries, communications with other carriers' res. systems.	- Opportunity to recoup some of massive fixed cost of CRS development/operation; makes vendor's system more attractive to retail trade.
Airport Handling	- Better check-in and gate facilites at larger airports; reduced costs expecially where frequency is low but spread over entire day; reduced training and supervisory requirements.	- Handling revenues to offset heavy fixed cost of airport operations; opportunity to handle transfer of connecting passengers.
Financing	- Financial institutions accept alliance agreement as evidence of security of revenue; major carrier's equity position provides considerable comfort to bankers.	- Assured feed traffic and withdrawal from money-losing stations/routes improves both operating viability and long-term prospects, and can free resources for sale or for use elsewhere.

limitations on the smaller carrier's route aspirations through fear of "splintering" its own established markets.

3. A marketing straightjacket.
The smaller carrier may find that it is prevented from offering new, innovative pricing on any of its routes, for fear of embarrassing, or setting an unfavourable precedent for, the major carrier. The smaller carrier may find itself unable to develop joint programs with any carriers, or associated businesses of those carriers, who are part of the opposite "camp". Indeed, the major carrier may insist on compatible advertising and promotional thrusts and be intolerant of any other initiatives by the smaller carrier.

4. Ceiling on fleet upgrading.
Those smaller carriers with long-term aspirations to acquire jet aircraft may find that such plans do not accord with the wishes of their major partner.

5. Expensive "obligations".
Being part of a carrier alliance may oblige a smaller carrier to offer lower fares or more service features, flight frequency, advertising or passenger amenities than it can realistically afford.

6. Subject to fee hikes.
Once in an alliance relationship, a smaller carrier can be subject to increases in the fees charged by the major carrier for such services as airport handling, reservations, and ticketing -- at the whim of the major carrier. The ability of the smaller carrier to negotiate can be severely curtailed by virtue of the fact that its alternatives, at that point, are few, costly or non-existent.

7. Employee unrest.
The smaller carrier can experience a decline in the "team feeling" that was so crucial to its growth and survival to date, due to a loss of a separate identity that may be perceived by its employees. In addition, the employees of the smaller carrier may become sensitive to the difference between their wage levels and those enjoyed by the major carrier's personnel. This could lead to unrest and/or increased unionization at the smaller carrier.

8. Additional operating constraints.
The major carrier may dictate certain scheduling requirements to ensure that the smaller carrier's flights coincide with its banks of connecting flights at its hub. Such requirements may be costly and disruptive for the smaller carrier. Similarly, new constraints on the smaller carrier may be imposed at airports where the major carrier provides gates and handling.

9. Management incompatibility.
It would be unusual to find that the management culture and direction at the major carrier is similar with that at the smaller carrier. Consequently, difficulty can arise simply from inability to communicate or lack of understanding between the two management groups.

The smaller carrier that can manage to manoeuvre its way through this minefield will find satisfaction in a successful alliance with a major carrier.

Critical Factors of Success

Despite the fact that most smaller Canadian airlines have formed some form of an alliance with either Air Canada or Canadian Pacific, it is clear that such an action does not, by itself, guarantee those carriers long-term profitability. An alliance decision simply gives the runner a number for all to see, a good pair of running shoes, and a position on the starting line. The race is just getting underway?

Indeed, managing the alliance relationship has simply become a challenging addition to the traditional critical factors of success in the airline business: a clear role, appropriate aircraft and cost controls:

1. A clear sense of purpose.
Any company must be able to define its mission, its role; the smaller airlines in Canada are no exception. That mission should be able to be stated briefly and succinctly. It is doubtful as to whether such a clear statement has ever been developed at most smaller Canadian carriers, emerging as each of them typically did at the hand of a strong-minded entrepreneur. The industry climate of 1986 and onward will require that each carrier determine specifically what it is and what it is striving to become and, just as important, the roles that it will not be attempting to play.

   Once developed, the other requirement is to clearly (and frequently) communicate this mission to its employees. The overriding theme of Peters and Waterman's epic "In Search of Excellence" is the instilling of a simple, yet clear, sense of mission by top management in the minds of those employed by them. As the Canadian airline industry leaves the glamour age of regulation behind and enters the hard competitive world, no carrier regardless of size can function without a clear sense of direction at all levels.

2. Operate the right (mix of) aircraft.
Flowing from point number one above is the decision of which markets to serve in order to fulfil the mission adopted. As associated decision, and yet one which

directly determines a carrier's success in those markets, is which aircraft to employ.

With respect to new vs. used aircraft, the criterion is one of utilization. If the route opportunities are such as to realistically allow high utilization, then new aircraft become feasible. The danger of buying new equipment arises when the decision is based on over-optimistic traffic projections, unrealistic predictions of action by competitors, and/or an assumption that passengers insist upon new aircraft.

With respect to size, the old adage "match the size of aircraft to the demand" still applies. What complicates the consideration are such things as routes with heavily-peaked demand patterns, the need to serve markedly different seasonal charter requirements, and the existence of a certain mix of aircraft already in the fleet. Current airline wisdom appears to favour a maximum of two types (sizes) of aircraft in the fleet.

Whichever aircraft are selected, the critical factor then becomes operational reliability. Without this, an airline cannot attract the essential ingredient to its ultimate success: customers. A decision to use older, used equipment, then, necessarily means a significant investment both in maintenance manpower and training and in spare parts.

3. Keep costs under control.
Interestingly, receivers report that the typical problem in a failed company is not insufficient sources of revenue but rather that costs have been allowed to get out of control. The airline industry is a high-fixed-cost-business, which can be more difficult to control and relate to than a business with high variable costs.

The key for the smaller airline is two-fold:

(a) for labour costs, know when to "make" and when to "buy"
(b) use the alliance relationship to hold down the other operating costs

A non-union environment is not essential to a smaller airline, but flexibility is. Knowing when to "make" or "buy" -- i.e. when to hire staff to perform a function vs. contracting for the service from another party -- is essential. If the smaller airline is to stay "lean and mean", it must develop good internal information systems, training and communication programs with its staff, ensure its wages are competitive, and let others carry the non-essential overhead.

The alliance relationship can be helpful in many cost

areas. For example, a major carrier can provide some useful negotiating clout in discussions with fuel suppliers. Product distribution costs can be shared by agreements covering such things as ticketing, reservations, commissions, advertising, and timetables. And the major carrier can offer its massive network of airport staff and facilities at a fraction of the cost of establishing a carrier's own handling capability.

4. Manage the alliance relationship.
The analogy frequently used to describe airline alliances is that of a marriage, and it is an appropriate one. The relationship will fail to develop both if one partner attempts to dictate to the other and if the two partners attempt to develop largely in their own directions. There must be frequent communication, an ongoing sharing of ideas, plenty of exploratory "what if" exercises. A mutual understanding must be acquired of the other party's strengths, problems, objectives and expectations. The process requires considerable maturity, since all expectations will not be met.

Two points are worth noting here. The first is that the concept of an alliance is new to the management of both carriers, and hence the management of the major carrier may not necessarily have any better ideas than those generated by those at the smaller carrier. Secondly, in order to work successfully, the concept of the alliance must be actively sold to the employees of both carriers, at all levels.

Conclusion

Under the new climate of "regulatory reform" in Canada, air carriers are being expected to fend for themselves. The larger carriers have been seen to make a number of moves aimed at ensuring their survival and prosperity in the coming years. In response to those moves, each of the smaller carriers in Canada are moving to align themselves to one of the major carriers in order to reduce vulnerability and to re-equip with more efficient aircraft in order to compete more effectively.

But the federal government must continug to modify its thinking with respect to air transportation in Canada. It must recognize the maturity of the airline industry, the fact that the government need no longer play the paternal role. It must allow maximum flexibility in areas such as pricing and route development. It must consult with the participants -- both large and small -- on airport design and construction and on mechanisms to deal with peaks in the air transport system. And finally, it must stand firm in its insistence to the United States government that opening of transborder rights must be accomplished with fairness not only to the major air carriers

but also to the smaller turboprop operators.

With improved dialogue between industry and government, the newly evolving structure of the Canadian airline industry can prove itself as a competitive, responsive and innovative transportation service for the people of Canada.

FINANCIAL OUTLOOK

Steven Yaron Garmaise

Communications and Transportation Analyst, Wood Gundy Inc.

Biographical Highlights:

In 1983 Mr. Garmaise began working with the Confederation Life Insurance Company in Toronto where he was resposible for advising managers of insurance and pension funds.

In 1984 he became an investment analyst at Wood Gundy with responsibility for analyzing airlines, other transportation companies, auto parts manufacturers, newspapers, cable TV and other media companies. Based on his research he advises institutional investors and retail brokers about investments in companies in his sector.

Steven Garmaise has a Diploma of Collegial Education from McGill University in Montreal and a Master of Business Administration from the University of Western Ontario. In 1986 he earned the title of Chartered Financial Analyst.

CANADIAN AIRLINES AND THE STOCK MARKET

Steven Yaron Garmaise
Communications and Transportation Analyst
Wood Gundy Inc.

Canadian airlines are a peculiar beast for most professional investors. Until very recently all we had to be concerned about was whether our plane landed on time and our baggage managed to find us. True, Wardair has been listed on the Toronto Stock Exchange since 1967, but its small market capitalization, heavy debt load, and erratic earnings record tended to deter most institutional investors.

Several developments over the past few years have served to awaken a stronger interest among institutional investors. They include:

- The public issue of Pacific Western Airlines in December, 1983, and the subsequent sale of most of the Alberta Government's position.
- The participation of a group of institutional investors in the buyout of Nordair.
- Hints by Canadian Pacific AirLines that they would like to sell a minority position to the public.
- Some public discussion of a partial privatization of Air Canada.
- The very strong possibility that several airline entrepreneurs will take advantage of a receptive market to sell part of their holdings to public investors.

Within the next several years, therefore, the presence of Canadian airlines on local stock markets will be impossible to ignore. And those stock markets will play an increasingly important role in the financing and future success of the Canadian airline industry. We'll have to understand each other. The purpose of this talk is to share some thoughts with the aviation community about how we, as professional investors, view the airlines, and how you should view us.

Overview: The Airlines Remain Scary

Who are these professional investors? Mostly institutions such as life insurance companies, pension funds, trust companies, investment counselling firms, and mutual funds. They account for about two-thirds of total trading volumes on Canadian exchanges.

All a professional investor really wants to do is to maximize his return while minimizing his risk - and beat his competition in the process. In simpler terms, he wants to buy stocks that are likely to go up, without much risk of a major collapse. We tend to be a rather conservative lot.

Airlines are scary investments for most institutional investors. Firstly, you are tough to understand. All this talk of load factors, ASMs, RPMs, yields. All industries have their own buzzwords, true, but the airline industry does seem to us to get carried away with its own vocabulary.

I wish I could say that vocabulary was our biggest problem. We have a lot more difficulty with the wide swings in airline stock values. In the United States, with a long and extensive trading history, airlines are the most volatile group on the stock exchanges. Our limited experience in Canada suggests that the group will follow a similar pattern here.

Investors like companies that increase their earnings in a consistent and predictable fashion. And it is hard to use these three words - consistent, predictable, and earnings - when referring to airlines over the past few years.

Let's start with earnings. Since 1981, the four major Canadian airlines have collectively earned a mere $46 million, on total revenues of over $20 billion. In 1985 net losses of these airlines totalled $9.3 millions. Were we to remove favourable tax adjustments, profits from non-airline divisions, gains on sale of aircraft, and other income, the picture would be even more gruesome, a loss of $128 millions. Not exactly the sort of record to inspire much enthusiasm. Industry losses in the first six months of 1986 exceeded $26 million, versus a $32 million profit in the corresponding period last year. We could beat the average airline's return on equity (ROE) with a savings account in the bank! And the U.S. industry's track record is not much better, with an average ROE of only 2.4% over the past five years.

As to consistency and predictability - well, there is little comfort here, either. Institutional investors do not make their buy and sell decisions lightly. They need lots of information - and they hate surprises. Yet the airline business often seems to be a never-ending series of surprises. Just when we think we've got the thing figured out, everything changes.

Small swings in load factors or yields can cause huge variations on the bottom line. The very high proportion of fixed and semi-fixed costs make the temptation to price on a contribution to overhead basis almost irresistable. Some airlines have been forced to add on excessive amounts of financial leverage to a business where the operating leverage is already very high, further increasing earnings volatility.

The deregulation of the Canadian industry has thrown an additional wild card into the works. The fight to gain market share before the industry consolidates has intensified. The ability to shift capacity means that few unprotected routes will remain very profitable in a period of excess seat capacity.

The airlines have taken some very serious steps to get their cost structure more in line with the new operating environment. Fuel prices have finally helped, as has a recent moderation regarding new equipment. Labour counts are down and flexibility and productivity are up. There is still a long way to go on the cost front - it is my impression that the Canadian industry has not gone as far as they have in the U.S. - but it is clear that things are moving in the right direction.

Why, then, is the industry not more profitable? Managements are not incompetent. Indeed, the calibre of management is at least as good in this industry as in others that I analyze. The problem lies in the structure and competitive forces at work in the industry today. The high proportion of fixed costs; the comparative ease of entry; the need for feeder traffic from unprofitable routes in order to maintain market share; the tendency of passengers to treat airline products as commodities (the "a seat is a seat is a seat" syndrome); these are but some of the factors that contribute to poor profitability. And we find it hard to believe that a turnaround will come soon. Let me quote a famous and very successful investor, Warren Buffett:

> "When a management with a reputation for brilliance tackles a business with a reputation for poor fundamental economics, it is usually the reputation of the business that remains intact."

There are a few rays of light. The combination of Expo 86, a weak Canadian dollar, and fears of terrorism overseas has helped boost short-term demand and yields within the country. And oil prices will make a nice contribution to airline earnings as well. So the third quarter should produce record earnings for many of the Canadian carriers. But we find it hard to get excited about the post-Expo operating environment, and indeed about the full year 1987. There are still too few signs of more responsible pricing, of more effective cost controls, or of stronger demand using up excess capacity.

How Do Investors Value Airlines?

It is hard to hide our gloomy view of the near-term earnings prospects for the Canadian airline industry. And don't forget that I come from a business where long-term tends to refer to next, rather than the current, quarter. Still, we have to decide how much to pay for airline shares.

Professional investors use a wide variety of investment styles and of valuation methods. There are market timers and group rotators, hard-core "fundamental" analysts and others who rely on such "technical" data as charts of trading histories. No one method is right - all that really matters is the ability to make money in the stock market. I would like to describe a few of the more popular methods of valuation, and how they apply to the airline stocks.

1. Price to earnings ratios. By far the most popular method with most investors, this is a convenient shorthand to decide how much to pay in the stock market for each dollar of earnings. Currently the Toronto Stock Exchange 300 index is trading at a multiple of just over 15 times trailing earnings - i.e., investors are willing to pay $15 per each $1 per share in earnings. Those companies that are growing more rapidly and have less risk trade at higher multiples; riskier, more cyclical, and/or slower growth companies trade at substantial discounts to the market multiple. The airlines in both the U.S. and Canada tend to trade, quite logically, with the latter group, usually around 2/3 of the overall market.

2. Price to cash flow ratios. This is a variation of P/E multiples, an attempt to smooth out distortions from accounting differences when calculating earnings. Deferred taxes, depreciation and amortization, and other non-cash items are added back to earnings to get a better indicator of the real earnings power of a company. Some industries - oil and real estate are two notable examples - trade mostly on this basis. In Canada few analysts emphasize this valuation method, but it is more popular in the U.S., where most airlines seem to trade at about five times cash flows.

3. Price to book value ratios. Although all agree that book values tend to seriously understate real asset values, this can be a handy valuation method when combined with returns on equity, i.e. what returns are the airlines earnings on those book values, and how much of a multiple to book should the market be willing to pay? Most U.S. airlines trade in a band just above their book values with their 5 to 10% ROEs, whereas the TSE as a whole is currently at 1.5 times book value., with an estimated ROE of about 10%.

4. Asset values. Aircraft depreciation policies depress book values well below the real economic values of those aircraft. With used aircraft prices at all-time peaks, most airlines in Canada and elsewhere trade at substantial discounts to their pretax asset values - calculated as the saleable value of their aircraft and other assets, less all outstanding liabilities.

Asset values can provide ample reason for investing in airline shares, particularly if there is some chance that those asset values would be realized in a takeover or other such deal. Unfortunately, too often analysts tend to overlook the possiblity

or likelihood of such a deal taking place. Neither publicly-traded airline in Canada can be acquired in a hostile takeover. There is also some question about whether asset values can be maintained in an operating environment which does not allow for meaningful returns on the real value of those assets, even in the U.S.

5. Turnaround story. When other valuation methods fail to reveal attractive relative values, some creative investors inevitably push a story that the company or industry is about to turn around. Investors are justifiably suspicious about such stories. For each success story like Chrysler, there are another 20 companies that remain moribund or go bankrupt. But the stock market is based on a consensus view of the future, and those who fly in the face of that consensus - and are right - can earn huge returns.

The turnaround story about the Canadian airline industry is gaining popularity. I cannot do it justice in this short time, but briefly, it goes like this: the Canadian airline industry is already in the midst of a substantial rationalization. Such a trend will continue, as it has in the U.S. (hopefully, more quickly and less painfully), reducing the number of carriers to two or three, cutting excess capacity, and leading to a promised land of responsible pricing, steady demand, stringent cost controls, and PROFITS! My cynical view is that we still face a long time in the desert before arriving at this promised land, but there are many other believers.

Conclusion: Diversity of Views Make the Market

Diversity of views is the basic glue of the stock market. It is true that I have a gloomy view of the airlines' earnings prospects. But other investors have different views; and the pendulum may well swing the other way. Finally, it is fitting to conclude a presentation to a forecast conference by reminding you that the best investment analysts are wrong 40% of the time. But that 10% margin above flipping a coin can earn investors a greal deal of money.

SESSION II – morning
GENERAL AVIATION OUTLOOK

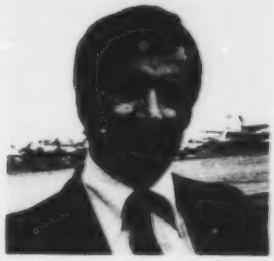
Session Chairman

Hugh Whittington
Editor and Publisher
Canadian Aviation

BUSINESS AVIATION

Hugh G. Whittington

Editor and Associate Publisher,
Canadian Aviation



Biographical Highlights:

Mr. Whittington joined Canadian Aviation as Editor in 1970 after a 15-year career as a reporter and staff writer on newspapers in Galt (now Cambridge), St. Catherines, and Hamilton, Ontario. In 1977, he was Founding Editor of Aerospace Canada magazine, a sister publication designed to provide in-depth coverage of Canada's aviation/aerospace and defence manufacturing industries. In January 1980, he was named Editor and Publisher of Canadian Aviation and Publisher and Editorial Director of Aerospace Canada. He relinquished these administrative positions in December of 1983 to concentrate on researching and writing for Canadian Aviation. In 1984, Mr. Whittington accepted a Special Commendation from the Air Transport Association of Canada in recognition of Canadian Aviation's "distinguished service as the pre-eminent periodical reflecting all sectors of the Canadian aviation industry".

A native of Guelph, Ontario, Mr. Whittington is a member of the Canadian Owners and Pilots Association, Canadian Aeronautics and Space Institute, Society of Air Safety Investigators, Canadian Society of Aviation Medicine and the International Air Line Passengers Association. He holds Canadian and U.S. Commercial Pilot Licences with multi-engine and instrument endorsements and has held French and Australian Private Pilot Licences. His approximately 1,200 hours of flying time have encompassed about 120 aircraft types. Mr. Whittington, his wife Barbara and two Airedale terriers live in Toronto.

BUSINESS AVIATION

Hugh Whittington
Editor and Associate Publisher
Canadian Aviation magazine

It's an honor and a pleasure to participate in this Department of Transport Aviation Forecast Conference and discuss business aviation with a group of aviation professionals. But the word ''forecast'' in the title of this symposium bothers me because I think the business aviation segment of the industry is just plain impossible to forecast with any accuracy because there have been too many inaccurate forecasts in the past. I talked to several knowledgeable people while researching this presentation; not one dared to venture a prediction of where Canadian business aviation might be at the turn of the century. We can be generally optimistic and hope for a brighter tomorrow, but there are too many variables to permit much other than a look into the crystal ball. So there's an up-front caveat.

''Business aviation'' is simply the use of an aircraft in the pursuit of one's business. It can be a lawyer flying his own Beech Bonanza to a client meeting; a group of corporate executives holding top-level planning meetings while enroute to a distant city in the company jet, or one it has chartered from an aircraft charter organization; a resource company transporting workers to northern exploration sites in a 20-passenger turboprop or 100-passenger jet; a forestry company helicopter surveying timber stands; or me renting an airplane to fly to Ottawa for this meeting. All are legitimate uses of an aircraft for business.

Business aviation can be broken down into two segments, which the DoT has defined for Civil Aircraft Register purposes as Business 1 and Business 2. Business 1 aircraft are those flown by professional pilots while Business 2 are generally flown by their owners. As of September 5 this year, there were 527 Business 1 and 2,679 Business 2 aircraft on the Register. The DoT began to compile this information a year ago. While it is not collected for statistical purposes, it would be an extremely useful data base on which to build a record of business aircraft usage, flight hours and attrition in Canada so that we might more accurately determine business aviation's role in air transportation. Such data have been almost impossible to collect in the past, with the result that we don't really know the magnitude of business aviation compared to commercial or other private flying.

But we know from a record of aircraft sales that the growth of business aviation in Canada paralleled that of other general aviation during the boom years of the 1970s. And it fell with the same resounding thud during the recession of the early 1980s. Unlike commercial aviation, however, neither business aviation nor the whole of general aviation have yet recovered from the recession despite improvements in the economy as a whole.

At the last Forecasts Conference in 1981 the DoT predicted there would be about 29,600 aircraft on the Civil Register by the end of 1985. There were about 26,800. It predicted 71,300 pilots by the end of 1985. There were about 60,700. In the period 1980-1984, total flying hours in Canada decreased by 20.27% with private aircraft flying hours paralleling that with a decrease of 20.58%. But the flying hours per aircraft dropped 18.15% against an overall drop in hours per aircraft of 16.77%.

The reasons one hears for this depressing state of affairs are as many as the number of people one asks. But I think the DoT's Aviation Aggregate Demand Indicators of last spring sum it all up quite nicely. Forecasting a 1.7%-per-annum growth in private general aviation fleet growth between 1984 and 1991, the paper states, and I quote, ''The relatively slow rate of growth forecast for the aviation fleet (when compared with historical levels) is based on a number of factors, including the rapidly escalating ownership and operating cost of aircraft, particularly general aviation aircraft. High product liability costs, low production runs, and the strength of the U.S. dollar in particular are contributing to these escalating costs. The large supply of low-hour used aircraft and the depressed state of many resource industries, who have been major users of general aviation in the past, have contributed further to this trend.'' (Close Quote). And then the paper makes a particularly frank statement: ''Finally, it would appear that businesses are generally becoming more reluctant to own and operate business aircraft.''

While the paper does not attempt to justify this statement, it is given credence from another source. Writing in the February 1986 issue of Canadian Aviation, Victor Bennett, Chairman of Innotech Aviation Ltd., said, ''If potential users (of business aircraft) have turned off recently, it may very well be that the cost/benefit ratio associated with business flying has become unfavorably out of balance. In other words, whereas businessmen accept in principle the premium cost for private corporate travel as opposed to other forms of transportation, they may now feel that the premium is simply too high.'' Bennett continued, saying that cost escalations both in the initial investment and the operating area have, quote, ''accumulated to such an extent that our clientele is having a difficult task justifying this expenditure, particularly in a period when productivity is a key word in the lexicon of business managers. Even though the well-

utilized business aircraft is a great contributor to management productivity, it is apparent that it may not be perceived as such due to the significant cost escalations associated with its ownership and operation.'' (End of quote).

(On this matter of initial acquisition costs, a U.S. FAA study on exports of U.S. general aviation aircraft found that a 1% increases in aircraft prices, adjusted for inflation, reduced exports by 3.7% and a 1% increase in the exchange rate reduced exports by 4.4%.)

Bennett's remarks are borne out by statistics covering flying hours. From the Aviation Statistics Centre's booklet Civil Aircraft Activity in Canada - 1984 we can see the decline in hours flown in most corporate/business aircraft, compared to 1980. Beech King Air - a very popular corporate turboprop - flying hours dropped by 45.6%; Cessna Citation - a popular corporate jet - flying dropped by 17.4%; Piper Aztec - an owner-flown airplane for the most part - hours dropped by 13.5%; Gates Learjet flying dropped by 26.8%; Gulfstream II - a large corporate jet - dropped by 25.5%. Behind these figures is a perhaps more important fact: the annual flying hours of some of these aircraft dropped below the number considered to be cost-efficient in terms of utilization.

Growth of business aviation in the early 1980s was also harmed, I believe, by the wrestling match between the corporate operators as represented by the Canadian Business Aircraft Association and the commercial operators represented by the Air Transport Association of Canada, and refereed by the Air Transport Committee. Basically, the commercial operators believed that some corporations were operating commercial flights without the benefit of a licence. After a public hearing and much filing of briefs by both parties, the Air Transport Committee released its decision on what constitutes a commercial air service and the matter is now, apparently, settled and the air is cleared. This may persuade some potential buyers, who were witholding a decision, to get into business aviation.

Well, we know where we are. The question is, where are we going? Some trends have become evident over the past couple of years which might help our forecasting.

For the remainder of this decade, there should continue to be an oversupply of good used aircraft and that should keep the prices down. By 1990 or so, this supply is expected to be back down to where it was early in the 1980s, which means prices will rise.

As well as ''new'' and ''used'' aircraft, we're beginning to see ''remanufactured'' airframes -- older, existing aircraft with new or zero-timed engines, updated avionics, new interiors, new paint. An example of this is the recently-introduced Fanstar, a Lockheed JetStar with two General Electric CF-34 turbofans in place of four Pratt & Whitney JT-12 turbojets which give the

remanufactured airplane better performance and much lower noise levels than the original. Older model HS-125s and North American Sabreliners have also been re-engined.

Business aircraft will become more regulated, especially in the areas of noise and safety. We've seen major steps on the safety side already in Canada and there seems little doubt it will continue as airworthiness authorities demand more stringent standards.

One aspect of business aviation that we're beginning to see in the post-deregulation environment in the U.S. is the question of airport access. The general aviation operating authority has been limited at some important airports as commercial airlines expand their operations. This bears watching in Canada's post-regulation age and I think the problem could be worsened here because of the lack of adequate reliever airports close to our major centres.

We've heard a lot about product liability insurance costs, with most of the U.S. manufacturers claiming that those costs are adding an across-the-board $70,000 to the price of an aircraft and could, if relief is not granted by the U.S. Congress, spell the death of the general aviation industry. I don't disbelieve them. But there probably will be a law passed before the end of the decade limiting the manufacturers' liability in some way but it doesn't necessarily follow that aircraft prices will fall an average of $70,000.

Most technological advances in business aviation will continue to be evolutionary, rather than revolutionary, leading to incremental gains in efficiency. I said ''most'' technological advances will be evolutionary because the Beech Starship is truly revolutionary, with its all-composite airframe and and other hither-to-untried advances. We'll see more use of composites, and developments in wing positioning and design, engine configuration and electronics. Most corporate operators are into computerized maintenance and there are many softwear programs available for crew and aircraft scheduling and flight planning. Digital systems are here and leading to lower weight and volume. Flight management systems and global positioning systems are gaining in acceptance and will, as time goes by, spread to the smaller business aircraft.

Some experts also see additional research coming into these areas: lower-cost manufacturing techniques, possible alternative methods of flight training based on additional human factors studies, the impact on all this technology on the pilot sitting up there in the pointed end.

These are all Good Things and make, or will make, the business airplane far more capable of doing its job. But technological change alone will not lead to a burgeoning of the Canadian business aircraft fleet. Parallel with these improvements must

be an improvement in the public's perception of the business airplane which right now is negative. The business airplane is seen as a ''perk'' benefitting a small corporate elite. To cite Victor Bennett again, ''The general aviation industry has not been successful in convincing its various publics that the role of the business airplane is a meaningful contributor to corporate growth and productivity. The industry may have misjudged this problem by devoting its efforts in the promotion of the quality or performance of its products, at the expense of marketing the corporate aircraft as a legitimate and valuable piece of industrial equipment.''

In summary, business aviation in Canada has its problems but business aviation -- like all other forms of aviation -- has always had problems. And they've always been worked out. There's no reason to believe the current crop of difficulties won't be solved, either. This industry is simply too dynamic and there's too much at stake.

Thank you for your attention.

PRIVATE AVIATION

Bill Peppler

Manager,
Canadian Owners and Pilots Association

Biographical Highlights:

Bill has been general manager of the Canadian Owners and Pilots Association, the 21,000 member aviation association, for 30 years. He has spent over 40 years in the general aviation industry as bush pilot, chief flying instructor and survey pilot and has accumulated over 10,000 flying hours flying in every part of Canada, including the Arctic. He has held a maintenance air engineer's certificate for over 35 years.

He and his wife, who is also a licensed pilot, keep in current practice by flying their two aircraft from the Rockcliffe airport.

For over 16 months, he has been a regular member of Transport Canada's Canadian Airspace Review Task Group, which is determining user demand for the next 20 years.

He is editor of Canadian Flight, Canadian General Aviation News, the monthly COPA Newsletter and the Flight Safety Bulletin.

COPA'S
GENERAL AVIATION OUTLOOK
FOR
PRIVATE AVIATION
PRESENTED AT DOT'S CANADIAN AVIATION FORECAST CONFERENCE, OCTOBER 21, 1986

Bill Peppler
Manager
Canadian Owners and Pilots Association

The future is not rosy. If we look at the entire aviation intrastructure, there are some dark clouds on the horizon. These include declining numbers of public-use airports, the prospect of increased individual user charges, increasing amounts of activity in product liability awards to plaintiffs, reduction in available airspace, and increasing regulatory burdens. These same potential negatives existed forty years ago. These same features were current alert items in 1946. They were just as credible a threat at that time as they are today, but over that forty year span, we have witnessed a phenomenal growth in general aviation activity. General aviation is resiliant and will weather the storm.

In our "crystal ball", we see the years to come as a time of opportunity. This will be the age of the entrepreneur; a parallel of the revolution in general aviation during the early 1930's when the large, expensive and inefficient biplanes gave way to the light aircraft of today. The Taylors, Pipers, and Aeroncas of yesterday are out there today in the form of the amateur-built parts manufacturers and the kit-builders.

The evolution of the regulatory structure can and should allow these individuals to become the next generation of general aviation manufacturers.

We are convinced from our indications of demand that general aviation has the potential for significant levels of growth in the next 20 years. It may be quite difficult to insert all these factors into the sophisticated econometric models that are used in forecasting aviation growth. But, rest assured that these factors will be included anytime decisions are made concerning aircraft purchase, venture capital, airport expansion and activity estimates. Without these factors we don't have a true picture of the years to come.

The private aircraft owner population has absorbed all the new $80,000 single-engine four-place aircraft it can afford. This conviction is reinforced by the forecast statement that aircraft shipments have recently failed to respond to an expanding economy as they traditionally did in previous economic cycles. The 1980's have given rise to many dual income families owning two automobiles, but few can afford the equivalent of a second home, in fact, most are having trouble affording the first. It seems very simple: general aviation can live only so long on the used aircraft market supplying the demand for affordable aircraft. At some point, the used aircraft will wear out, the parts will be unaffordable or unattainable, or the increased demand will force the price up.

We predict that the numbers of general aviation pilots and private aircraft owners will grow at a slow but steady rate in the next thirteen years. A minimum growth of 1% is expected; a maximum growth of 3% is possible. Canada is the most air-minded country of the world. There are more pilots and aircraft owners PER CAPITA in Canada than in any other country, including the great U.S.A. The interest in learning to fly is as great today as it was in the 60s and 70s when Transport Canada was showing a pilot population growth and civil aircraft registry growth of 10% annually. You ask, "What happened to turn Canadians away from the general aviation airport in droves?". The answer is quite simple: "High Cost".

It costs $3,000 to get a private pilot license in the U.S.A. and at least $4,000 in Canada. For the forecast period, the slowing growth of the general aviation fleet, complemented by the shrinking numbers of student and private pilots, translates into decreasing levels of activity.

The FAA is promoting the creation of a recreational pilots license - limited privileges but cheaper and easier to obtain. Also, it is attempting to establish a "persona'-and-pleasure-use-only" category of aircraft with simplified certification procedures, maintenance criteria and airworthiness certification.

Many journalists have attempted to point out that the relative cost of owning and operating a light aircraft today is as relative to one's earning power as it was in yesteryear. For instance, in the early 1950s, fuel cost 30¢ per gallon and a certain tradesperson earned $5,000 per year which enabled him/her to fly a used 2-place Cessna 140 that cost $1,500. Today, aviation gasoline is about $3.00 per gallon in some places; the same tradesperson earns about $50,000 per year and his/her aircraft is worth about $15,000. In other words, inflation has increased everything by ten times over four decades. But, something else has happened in our society. In the 1950s, the 2-3 car family was unheard of; attractive vacation packages to distant corners of the globe were not in vogue. One TV in the house was sufficient and TV recorders were not heard of. Families didn't go out to dinner as often. Today's moderate-living person wants a boat, cottage by-the-lake, a motor cycle or dune buggy to use during extended vacation periods which are twice as long as they used to be. In short, the average air-minded Canadian today has far more places to spend surplus money than was the case 30 or 40 years ago. Of course, there will always be those super-keen types of individuals who will deprive themselves of all other worldly goods in order to devote 100% of their excess funds to flying and maintaining an aircraft. Nevertheless, a study undertaken by COPA revealed that the real reason pilots are not flying as much as previously is because they can't afford to and not because they have lost interest. These same people in our study included doctors and lawyers whose income was ever-increasing. But, it was also noted that they were building additions to their summer cottages or buying more expensive cars.

COPA believes that this scenario will continue in the years ahead and throughout the 1990s. Pilots will begin to do more flying when the cost begins to drop and provided their surplus earnings remain the same.

It is interesting to note that in spite of the decrease in the rate of growth of the pilot population in the 1980s, as compared to the 60s and 70s, the membership in the Canadian Owners and Pilots Association has continued to grow. Also, attendance at aviation conventions and air safety seminars remains as high as ever. This proves that the interest in flying is as great as ever, even if the relative high cost will not allow pilots to fly as much as previously and as much as they would like.

It should be recalled that throughout the 1950's, 60s and 70's, the big three light plane manufacturers - Beech, Cessna and Piper, were producing new aircraft models annually. They spent a portion of the gross sales on advertising, publicity and PR. This meant that thousands of Canadians were coaxed into learning to fly because of the zesty and flambouyant ads and TV commercials which appeared regularly. The advantages of learning to fly were brought to the attention of the local population through advertising in one form or another and, no doubt, countless student pilots were lured to the local airport as a result of becoming inspired. This type of aggressive promotion has been absent for most of this decade.

In 1979, the general aviation industry produced 17,000 aircraft. In 1986, they will produce 1,300. General aviation manufacturing has declined 249% from 1982 to 1986. The general population is no longer being bombarded with the promotional material that was so characteristic of the industry for several decades and this, undoubtedly, has contributed to the decline of enrollment at flying schools in recent years.

Even if there is no "learn-to-fly" promotion in Canada for the next 13 years, COPA believes that the pilot population will increase, slowly but surely, as more of the general population hear by word-of-mouth that, next to being married, learning to fly an aircraft brings many rewards.

The number of airports dedicated exclusively for general aviation use will gradually diminish at major cities as real estate developers offer substantial monetary rewards to owners of G/A airports. In Toronto, for instance, the King City Airport is due to close on December 31, 1986. The Maple Airport is living on borrowed time, and our guess is that it will be closed in two years. The Markham Airport's future as a public airport is questionable. The Toronto Island Airport, formerly a G/A stronghold, is now predominantly an air carrier airport. Even the busy Buttonville airport is being eyed by land developers. In spite of the fact that airports will not be as numerous around the major cities as they once were will not deter aircraft owners from operating their aircraft. We see that the existing airports will have to become more efficient and ways and means must be found to enable the capacity of present airports to be increased. For instance, there is no reason why Toronto's Pearson International Airport could not have a new runway built exclusively for G/A movements which would not interfere with existing air carrier movements. Existing government-controlled airports, like Toronto's Downsview, should become general aviation airports as this could be accomplished at little or no cost to the taxpayer.

A final gaze into COPA's crystal ball shows a slow growth in the pilot population to year 2000. The number of G/A aircraft will grow very slowly as a result of kit planes, amateur-built aircraft, and used aircraft being imported. The so-called Air Recreational Vehicle will emerge in a couple of years, but its price tag will not make it attractive while higher-performing used aircraft can still be purchased for less cost. A number of large city G/A airports will disappear, forcing plane owners to re-locate on busier airports which, in turn, means increased utilization of those resources. The big problem is cost of flying which will gradually increase due to higher gasoline prices, higher taxes and user fees, and higher storage fees.

In spite of these negative drawbacks, Canadians will overcome these obstacles and private aviation will continue to provide a beneficial service for over 100,000 licensed pilots by the early 1990s.

RECREATIONAL FLYING

Victor Whitmore

President,
Ultralight Pilots Association of Canada

Biographical Highlights:

Victor Whitmore is a graduate of Seneca College in Electronics Engineering Technology and is currently employed by a major telecommunications manufacturer in the sales technical support area. His interest in aviation was kindled in youth but not realized until the advent of ultralights. After joining the ultralight community, he has been actively involved in its associations. He is currently the president of the Ultralight Pilots Association of Canada and a member of the Experimental Aircraft Association of Canada.

ULTRALIGHTS RE-KINDLE ACTIVITY

Victor Whitmore

President
Ultralight Pilots Association of Canada

We are all aware of how past years of inflation and recession have turned the aviation world upside down. Just a few years ago, airlines were highly profitable and travel patterns showed ever increasing numbers of people were flying everywhere. Reality today shows a vastly different industry that is struggling out of the doldrums after a period of high competition, price cutting, wage cut-backs, and efficiency measures. Only recently have the worlds major airlines shown improved growth in revenues and profits. But what lies ahead for other areas of aviation should prove to be an interesting guess. One indicator does not bode well for the industry in general. The amount of pilot activity has declined as well as the number of pilots and students. With a smaller market base the industry could be hurt in two different ways. With fewer participants, less goods and services will be sold and qualified airline pilot candidates may be fewer than are available today.

There may be a glimmer of hope in a new growing field of aviation....ultralights. This activity is bucking the trends and growing even though its associated costs have risen. This new breeding ground of tomorrows pilots should not be overlooked, nor dimissed as a passing fad.

In the mid 70's, very low cost minimal aircraft evolved from the hang-glider fraternity and a seed began to grow. Minimal regulations and the low cost of these machines promoted a rapid growth. Many people predicted that ultralights would be as popular as snowmobiles or "airplane for every garage" was re-born. True to form, we have discovered once again that predictions can be wrong. Ultralights are still very popular but the growth has been more conservative than early predictions. What can we learn from this industry and how can we use this knowledge to promote other forms of aviation?

A closer examination of this phenomenon may help us understand why thousands were drawn into this activity. The desire to fly lurks in many of us and most of us here have had the pleasure of partaking by one means or another. Some are total devotees that just have to fly and spend every cent that they earn to put towards flying. These people will fly no matter what it takes but the average person is more hesitant. His flying budget is limited by the costs of raising a family and living within his means. Ultralights were a dream come true to that average avid observer. This new affordable way to fly now allowed him to participate.

Pilots really didn't care that these machines were not suitable to go anywhere or were limited to ideal conditions. They just wanted to fly for the joy of it. When comparing costs to conventional aircraft, ultralights were very appealing. A typical ultralight could be purchased for as little as $4000 and sometimes less. Operating costs were a joke. At a couple of gallons an hour for the gas guzzler models, ten bucks could fill a whole day of activity. Regulations were practically non-existent as this activity was considered a sport. As most of the flying was done in rural areas away from populated centres or airports, there was little need to protect the public with stringent regulations.

Things were really heating up until the last recession hit. With less disposable income, Mr. Average decided that a little descretion would be appropriate and sales dropped off accordingly. Several manufacturers went out of business and all those remaining had to down size dramatically in order to survive. The boom faltered but it didn't fizzle out. Today interest levels are more subdued but steady and ultralight aircraft registrations are still growing (20% from Dec. 84 to Dec. 85).

What is attracting today's pilot to ultralights and not other forms of general aviation? It primarily boils down to cost and the cost is still significantly lower than other alternatives. For new pilots getting involved, instruction costs are a fraction of the cost of a Private Pilot's rating. After spending four thousand dollars and gaining sixty hours of experience a Student Pilot could expect to get his ticket. However, in an ultralight, the typical student is licencable at ten hours at a cost of $600 to $800. The cost of ownership is significantly lower for ultralights as well. Even with todays costs closer to $10,000, it is still much cheaper than buying a used Cessna 172. When compared to buying a low cost older Cub or Champ, ultralights may appear less attractive but when the operational costs are considered, they still come out on top. With no annual inspections or major overhauls required, operating costs are just fuel and parts. Servicing can be done by the owner/pilot or when performed by a dealer mechanic, the service rates much less than an AME. When ultralights are compared to homebuilt aircraft, they often come out on top for a new pilot. It usually takes hundreds of hours to complete a kit and ends up costing thousands more. A Private Pilots licence is required with its thousands of dollars in costs making the home-built alternative even less attractive. New ultralight designs entering the market today are far more advanced than just a few years ago. Long gone are the "flying lawn chairs". A more typical ultralight is semi or fully enclosed, has full three axis conventional controls, and looks and flies "like a real airplane". From a distance, you may not know be able to tell the difference. Many pilots that considered home-builts as the only way to own an aircraft now look very seriously at this new source. More often than not, the choice is an ultralight.

Is the ultralight industry eroding the traditional light aircraft marketplace and training schools? The statistics show that

traditional areas are declining while the ultralights are on the rise. While the ultralight industry has never tried to encroach upon the traditional marketplace, high conventional costs rising have turned the average student off to flying. Ultralights just happen to be there to pick up those that are persistent enough to find a way to fly.

It is amazing that this young industry has suceeded to this stage with no "assistance" from regulatory bodies. In truth, the Canadian regulations pertaining to the operation of ultralights are reasonable minimum rules that have allowed the movement the freedom to improve itself. This "hands off" approach has allowed the marketplace to evolve and mature to the point that todays ultralights are well designed, safe, performance aircraft.

If we are to use this new incubator of pilots, several actions should be promoted to allow this sport to grow into the mainstream of aviation. Some very important issues will be presented within the near future that will have an impact on this sector of aviation.

Currently, licencing regulations do not encourage ultralight pilots to migrate up to more sophisticated aircraft. A high time ultralight pilot must start from zero hours just the same as the fresh student off the street. Recognizing some of the limitations of his past experience (for example use of instruments, radio, and navigation), at least some credit should be given for the basic flight skills achieved. "Seat of the pants" flying teaches some long lasting basic skills that most students take many hours to become familiar with. Presenting a higher goal to attain in a structured approach may encourage the migration of some pilots from ultralights to conventionals.

Ultralight standards have been adopted in some countries to maintain a degree of control. While viewed as a positive step by many, others have seen standards as a crippling blow to the popular sport. However standards do tend to legitamize ultralights in the eyes of the general public. Discussions are underway in Canada in respect to revising current standards to encompass ultralights. Included in the proposals is a new class of aircraft best described as an Air Recreational Vehicle. This new aircraft will be used primarily for recreational purposes with limited commercial applications. If the proposals are adopted in a manner that will provide greater participation in a exciting new form of aviation, the whole industry will benefit from its growth. We should encourage standards that will not choke out this breeding ground but will encourage its growth and thus the flying community in general.

Easing of current regulations also helps to reverse the decline in general aviation. A prime example of this is the new "on condition" maintenance program for registered aircraft in Canada. Allowing owner/pilots to perform basic repairs and have overhauls performed only when required, helps to lower the cost pleasure flying. Lower costs will encourage more activity and a more healthy aviation community.

In summary, ultralights have proven that the desire to fly still burns in the hearts of many. The steady growth of the past few years should continue with little encouragement. Encouraging this

area of flight to grow will return dividends to the general aviation community. Promoting evolutionary changes in regulations to allow new areas to blossom and costs to decline will also help to reverse the past trends.

Lower costs....the future depends on it.

SESSION II – afternoon
TECHNOLOGICAL OUTLOOK

Session Chairman

Mark Brenckmann
Director, Research Program Development
Transport Canada

LARGE COMMERCIAL JET AIRCRAFT

Robert W. Leonard

Director, Program Engineering Advanced Technology,
Douglas Aircraft Company

Biographical Highlights:

Dr. Leonard since 1982 has had management responsibility for Douglas Aircraft Company engineering technology research and development. His previous experience was with the U.S. National Aeronautics and Space Administration (NASA) beginning in 1949 conducting research into mechanical engineering problems related to aircraft structures. From 1961 - 1971 he was head of the Structural Mechanics Branch and from 1971 to 1976 was Assistant Chief, Structures Division and Associate Chief, Structures and Dynamics Division. From 1976 to 1981 Dr. Leonard was Manager, Aircraft Energy Efficiency Project Office.

He has a Bachelor of Science in Naval Technology from the University of Minnesota, a Master of Science degree in Engineering Mechanics from the University of Nebraska and a Ph.D. in Engineering Mechanics from the Virginia Polytechnic Institute.

TECHNOLOGICAL OUTLOOK FOR LARGE COMMERCIAL AIRCRAFT

Dr. Robert W. Leonard
Director, Program Engineering
Advanced Technology
Douglas Aircraft Company

INTRODUCTION

Since the initial achievement of flight and its application to human public transportation, technology advances have been steadily applied to meet a variety of objectives like those listed in Figure 1. Of course, the public welfare must be served and safety, in particular, has always been the highest priority technology objective. Once air transport became the primary and the safest form of public transportation, public concern expanded to encompass environmental issues, like noise. Such issues, of course, include the cabin environment for passenger comfort.

The other fundamental objective of air transport technology is airline economic viability. The steady growth of aircraft passenger capacity and range to meet market demand in the 1940's and 1950's increased greatly airlines income producing potential. So did the revolutionary speed increase of jet transports introduced in the late 1950's. But airline economic success, through these years and since, has depended strongly on application of technology toward cost-saving efficiency improvements. In fact, the influence of technology on direct operating cost (DOC), which includes the cost elements listed in Figure 1, is widely used to determine technology priorities and to measure technologies' impact.

Figure 1. Commercial Air Transport Technology Objectives

Since the purpose of this paper is to convey the outlook for application of technologies to commercial transports through the next decade, it will be useful first to examine the expected breakdown of DOC in the 1990's as a means of defining the probable goals at which technology will be aimed in that period and the kind of advanced commercial aircraft that may emerge. Then we will summarize key technology features that can be expected in new subsonic aircraft introduced in the 1990-2000 time period and their relative benefit potentials in terms of one of the major elements of DOC. Finally, having looked ahead to year-2000, we cannot ignore the recent surge of interest in high speed civil transports. We will, therefore, look briefly at economic reasons for renewed interest in such transports and at their current development status.

FUTURE TECHNOLOGY GOALS

Because a primary objective of technology in commercial aircraft is reduction of direct operating cost (DOC), the expected breakdown of DOC among those contributing elements that can be affected by technology is an important basis for projecting technology benefit potentials and for technology development and application decisions. But the breakdown of DOC is strongly affected by external economic factors and subject to change. Figure 2 shows two recent projections of the expected make up of DOC in the year 1995. One of these projections (at left in Figure 2) was made in 1980 when fuel was expected to escalate in price at a 5 percent per year rate to a cost of $2.30 per gallon in 1995 and interest rates in that year were projected to average 8.5 percent. The result was expected dominance of 1995 DOC by fuel costs and strong emphasis in 1980 of technology efforts toward fuel efficiency.

However, the 1985 year-end forecast (at right in Figure 2) is based on widely different expectations. Fuel prices are expected

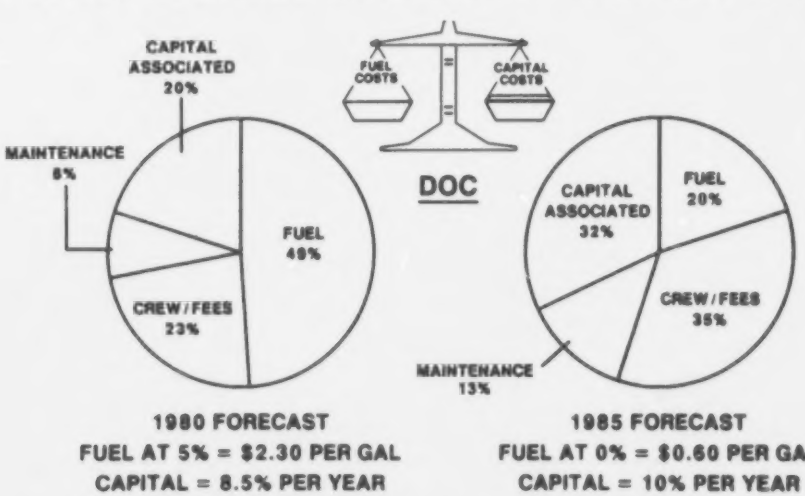


Figure 2. Typical 1995 Operating Cost Distribution

to average zero growth from 1985 to 1995 and to remain at the current low $0.60 per gallon level, while now-expected 1995 interest rates are 10 percent. Thus, the influence on 1995 DOC of the capital cost of aircraft ownership is now seen greater than the influence of fuel cost suggesting technology and product decisions should now give more emphasis to minimum product price.

Indeed, one result is a near-term marketability advantage for derivative over new aircraft because, while technology changes in derivatives are limited in their kind and payoffs, they frequently may be applied so as to preserve experience-based manufacturing cost reductions. For example, Figure 3 summarizes configuration features of a recently defined derivative called the MD-90X. The MD-90X is a stretched version of the McDonnell Douglas MD-80 with capacity increased to 179 passengers. New technology includes larger, more fuel efficient engines, selective substitution of less dense aluminum-lithium alloys for current alloys in heavily loaded structure, and selective introduction of new displays in the cockpit. Other changes are confined to those required by the increased size and weight.

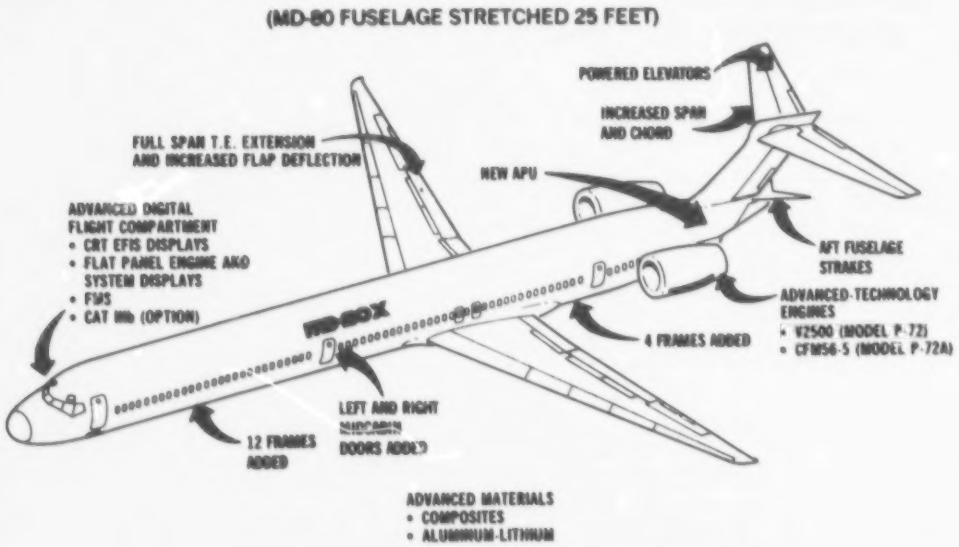


Figure 3. MD-90X Configuration Features

The resulting expected DOC of the MD-90X is 5 percent less per seat mile (Figure 4) than either the new Airbus A320 or the largest version of the nearly new Boeing 757. This advantage results from emphasis of minimum vehicle cost along with the selective application of fuel-saving technology advances.

This does not mean there is no future for all-new transport aircraft. It only emphasizes that the technology advances applied in a new aircraft must provide DOC benefits sufficient to offset the penalties of its inevitable higher cost. Moreover, while the current low price of fuel is expected to last well into the 1990's, its ultimate return to higher levels is generally conceded. For

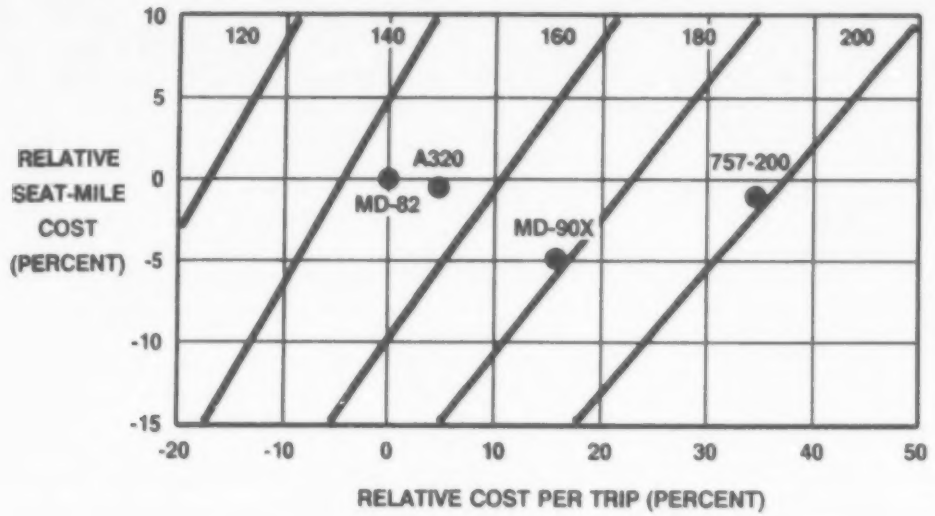


Figure 4. Direct Operating Cost Comparison

example, Figure 5 is a current marketing projection that shows a gradual climb in fuel prices above the general inflation rate after 1995.

Thus, while derivative aircraft may well best meet the air transport industry's needs for the next decade, new transport aircraft will be needed in the decade that follows. And, since new transport aircraft of that period will have operational lives that extend well into the next century, fuel efficiency remains an important commercial transport technology goal. The following sections of this paper will focus on technology for new transport aircraft and will use resulting fuel efficiency gains as an approximate measure of their relative and combined merit.

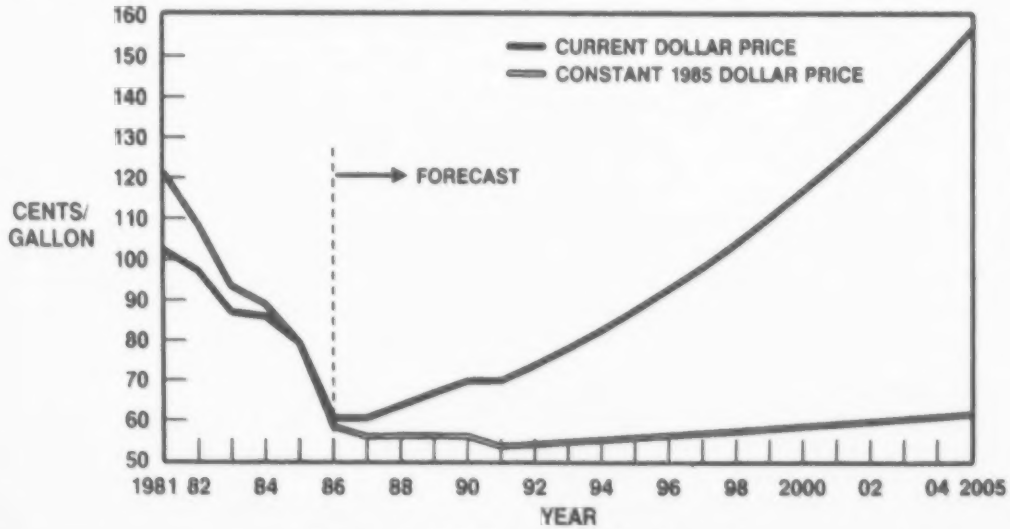


Figure 5. U.S. Kerosene Price Forecast

SUBSONIC TRANSPORT TECHNOLOGY OUTLOOK

Emerging technology advances that will significantly impact new subsonic commercial transports to be introduced in the 1995-to-2000 time period, include improvements in control and other systems, major changes in airframe primary structures, geometry and other changes toward significant drag reductions, and new fuel-efficient engines. These are briefly addressed below, in that order.

Advanced Control Systems - Digital control systems will continue to evolve with improved system architectures, communication media, and computers. On the flight deck (Figure 6) information will be presented to the 2-man crew in advanced formats on full windshield head-up displays and flat, touch-panel displays. Control commands will be input through modular side-stick, throttle, etc. units that can be repositioned in the cockpit to suit the needs of the pilot and co-pilot. The cockpit will be compact with careful design for high visibility and efficiency.

More and more "artificial intelligence" will be added with each succeeding generation of new or derivative aircraft until the system's flight control computers become genuine "pilot associates", able to materially assist the crew in their monitorship and flight management functions. These control systems will be highly modular in their construction with spare modules and capability to detect and correct or by-pass system faults to achieve ultra-reliability in their operation. Signals will be transmitted in redundant paths via fiber optics for relative immunity to electromagnetic interference from lightning or other electrical sources.

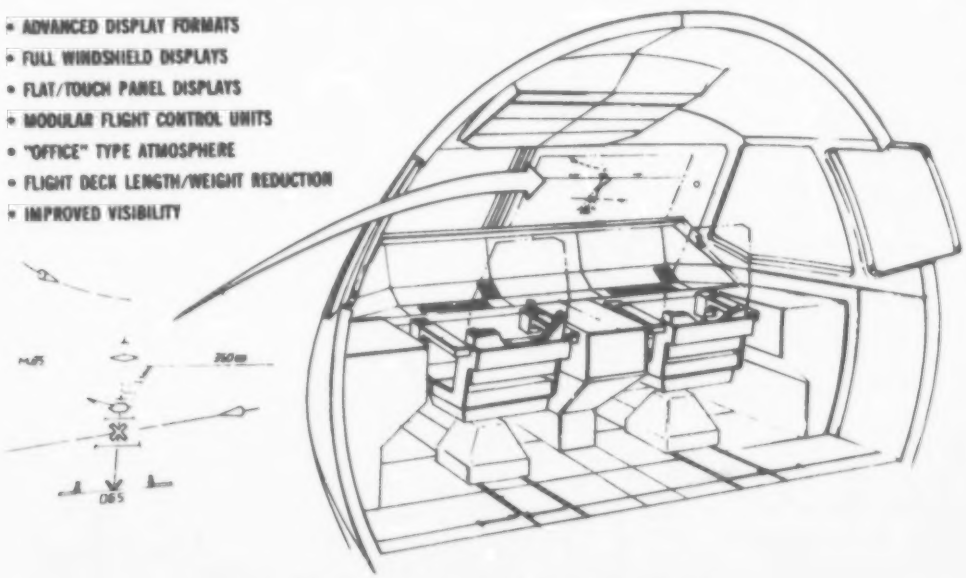
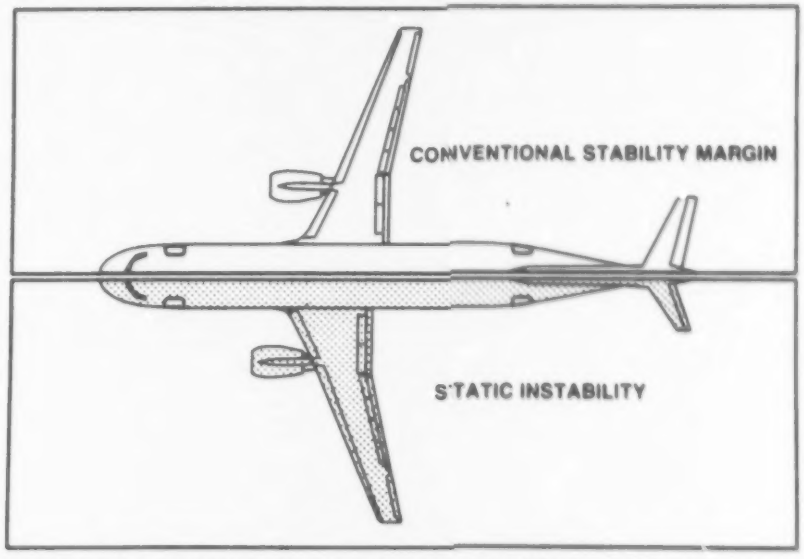

• ADVANCED DISPLAY FORMATS
• FULL WINDSHIELD DISPLAYS
• FLAT/TOUCH PANEL DISPLAYS
• MODULAR FLIGHT CONTROL UNITS
• "OFFICE" TYPE ATMOSPHERE
• FLIGHT DECK LENGTH/WEIGHT REDUCTION
• IMPROVED VISIBILITY

Figure 6. Advanced Flight Deck — Year 2000

This ultra-reliability of on-board computers and fiber optic distribution systems for sensor and control signals will also permit flight-critical "active control" functions. In particular (Figure 7), active stability augmentation will safely permit small horizontal tail surfaces for reduced weight and statically-unstable load distributions for reduced trim drag and corresponding fuel savings.

The required rapid movement of control surfaces will be achieved in year-2000 by electro-mechanical or electro-hydraulic actuators utilizing powerful supermagnet materials. This will permit electric secondary power generation and its efficient, reliable distribution via lightweight, high-speed-switching power management systems. Weight reduction and elimination of inefficient engine-bleed systems will yield further fuel savings.



POTENTIAL SAVINGS OF 4 TO 5-PERCENT FUEL BURNED

Figure 7. Active Controls — Horizontal Tail Sizing

Airframe Structural Weight Reduction - Airframe structures in today's typical in-service aircraft contain about 80 percent aluminum and are only a few percent composites. This is diagramed on the left in Figure 8. One scenario as to the probable distribution of structural materials in aircraft designed in the 1990's is diagramed on the right. It holds that such aircraft will remain about one-third aluminum and become at least 13 percent composite with another one-third going either way depending on technology developments.

The "advanced aluminum" referred to in Figure 8 includes aluminum-lithium alloys that are nearly ready to begin delivering 8 percent weight savings in selective substitution for current alloys in derivative aircraft. Used in new aircraft, they can

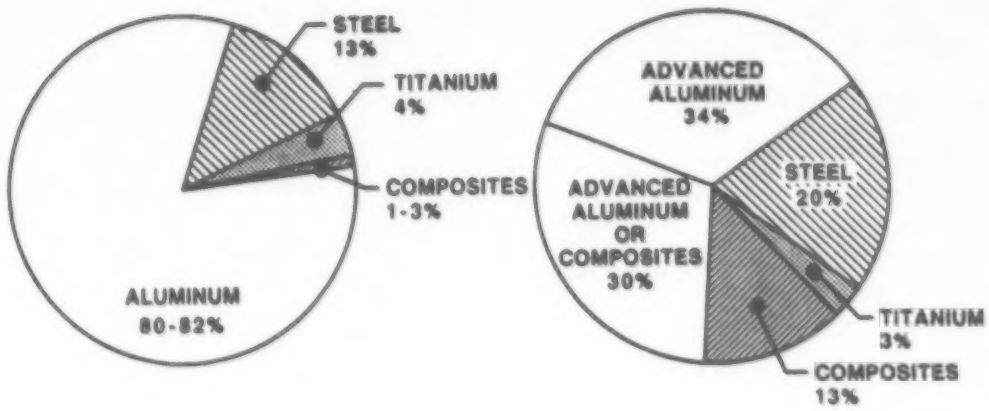


Figure 8. Structural Material Usage in Commercial Transport Aircraft

deliver additional advantage by virtue of their 10 percent higher stiffness. The composites referred to in Figure 8 are mostly carbon-fiber composites which will deliver weight savings ranging from 20 to 35 percent depending on type of structure. Readiness to apply carbon-fiber composite materials to commercial transport airframe structure is evolving as shown in Figure 9. Applications to control surface and other "secondary" structures are prevalent on all recently introduced new and derivative aircraft. And, readiness to apply composites to empennage and other medium-size primary-load-carrying structure has now been achieved. For

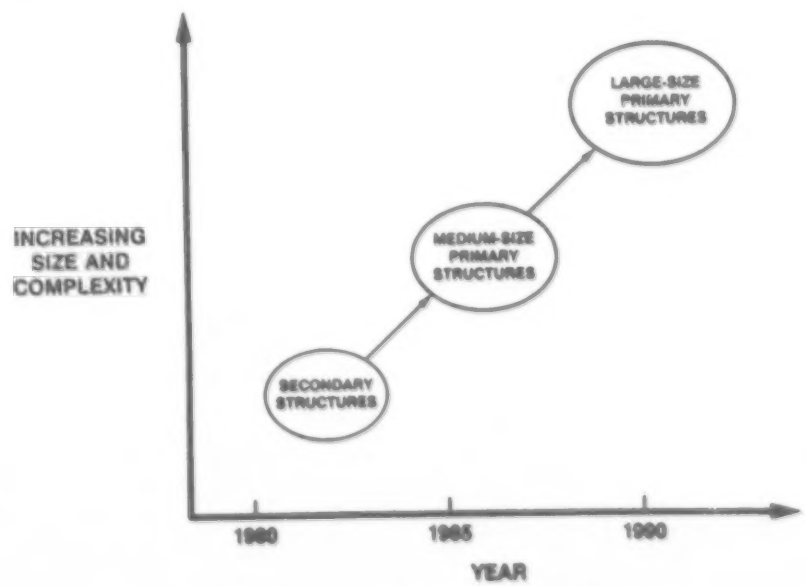


Figure 9. Composite Structures Development

example (Figure 10), Douglas with NASA help, recently completed all the ground and flight testing required to obtain FAA certification of a DC-10 composite vertical stabilizer for commercial flight service.

Preparations for composite applications to wing and fuselage primary structure are proceeding toward initial readiness for complete-wing applications by 1991 (Figure 9) in time for new aircraft introduced in the mid-1990's. Concurrent fuselage applications will include thin skins of Aramid (fiber) Reinforced Aluminum Laminate (ARALL). By the turn of the century, we will see initial applications of high performance metal-matrix composites to both wing and fuselage structure.

Figure 10. DC-10 Composite Vertical Stabilizer

Aerodynamic Drag Reduction - In new transports of the 1990's, composite wing structure and active controls for wing load alleviation and flutter suppression will be combined with the thick airfoil sections of (already well developed) advanced supercritical wing technology to enable very-high-aspect-ratio, reduced-sweep wing geometries that will reduce aircraft drag by 8-10 percent.

The mid-1990's will also see the first application of practical methods of boundary layer control for drag reduction. One of these methods, termed "Laminar Flow Control (LFC)", has been under development for some 10 years with NASA support. A Douglas defined system for maintaining the whole wing upper surface boundary layer in a laminar condition for friction drag reduction is shown in Figure 11. This system applies suction through fine perforations in the upper surface titanium skin. The air is

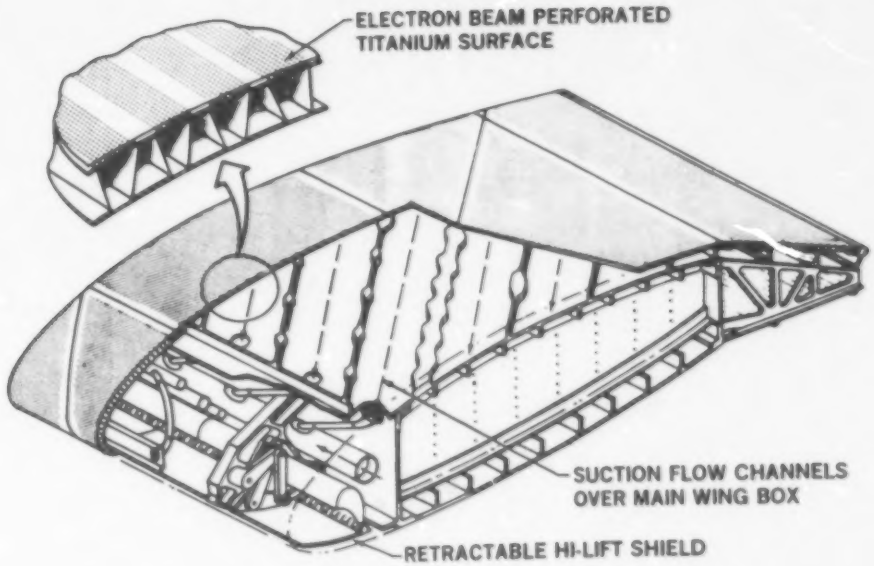


Figure 11. Douglas/NASA Porous-Upper-Surface LFC Concept

channeled through the fluted core of the outer sandwich, and between stiffeners of the structural box beneath, to ducts in the wing leading edge. It then flows through these ducts to the main propulsion system or separate suction engines.

Two NASA-funded LFC systems have been tested in simulated airline service on a NASA JetStar aircraft for a period of two years. The photo (Figure 12) shows the Douglas system on the right hand wing.

Figure 12. Douglas Laminar Flow Control Leading Edge on NASA Jetstar

This system achieved laminar flow on its first flight and did so consistently throughout the test program under adverse winter and summer conditions without special servicing procedures.

First applications of LFC will be in a so-called hybrid system with suction only in the wing leading edge region forward of the front spar. The wing upper surface will be contoured to provide a pressure gradient favorable to maintenance of the laminar flow established by the leading edge suction system. And, supercritical wing profiles are indeed compatible with maintenance of natural laminar flow for some distance aft of the front spar.

Along with hybrid laminar flow over the forward upper surface of the wing, new transports in the 1990's will see initial applications of surface treatments to control the size and character of the turbulent eddies in turbulent boundary layer flows over the wing undersurface and the fuselage. The most likely treatment to be the first applied is a surface coating that has fine grooves and "riblets" roughly parallel to the surface flow. Extensive NASA in-house and contract research has shown that such surface treatment can reduce the viscous friction drag of the treated surface area by 6 to 8 percent.

Engine Efficiency Improvement - The high propulsive efficiency of propellers was sacrificed for the higher speed of turbojet powered aircraft in the late 50's. With the shift to ducted turbofans and to higher and higher ratios of bypass-to-core flow, the trend shown in Figure 13 has been toward recovery of this high efficiency. The industry now feels ready to introduce Ultra High Bypass (Propfan) engines for complete recovery of propeller efficiency without sacrificing jet speed.

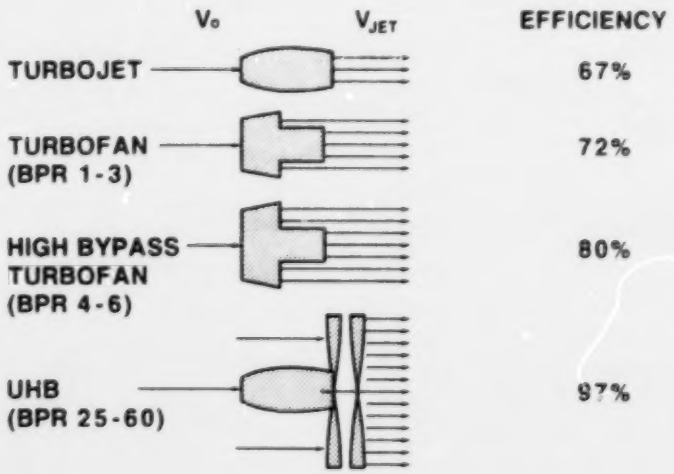


Figure 13. Ideal Propulsive Efficiency Comparison

Two kinds of UHB engines are under development (Figure 14). Both have small diameter multi-bladed, highly sculptured "propfans" which may be arrayed in two counter-rotating disks. In one, the propfans are driven through a gearbox whose extension to the necessary power transmission levels is a major development problem. The other is a new gearless concept with propfan blades directly driven by internal turbine blades attached to the same disk.

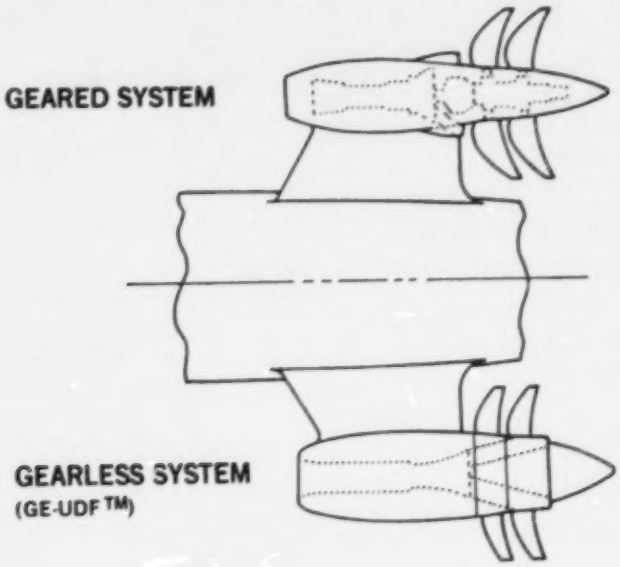


Figure 14. UHB Concepts

Integration of these new engine concepts with an airframe presents numerous challenges. One is minimizing drag by properly shaping engine nacelle, pylon, aft fuselage, and tail surfaces; another is assuring stability and control at low speeds. Wind tunnel tests, like that shown in Figure 15, are being conducted and analytical methods developed and used toward these ends. Also underway is vigorous R&D to minimize external and cabin noise from the high speed propfans during takeoff, cruise, and landing.

Both types of UHB engine will be test flown in 1987 on an MD-80 (Figure 16) to demonstrate their performance in such aft-fuselage applications and evaluate cabin noise control methods.

The first potential Douglas application of UHB engines would be in the 110-seat derivative of the MD-80 shown in Figure 17 (called the MD-91X because it might enter service in 1991). A second option under evaluation is a 150-seat derivative of the MD-80 called the MD-92X.

Also under evaluation is a new aircraft for introduction in about 1994 and, therefore, called the MD-94X. One option for this aircraft is the UHB-powered configuration shown in Figure 18. However, other options are under study.

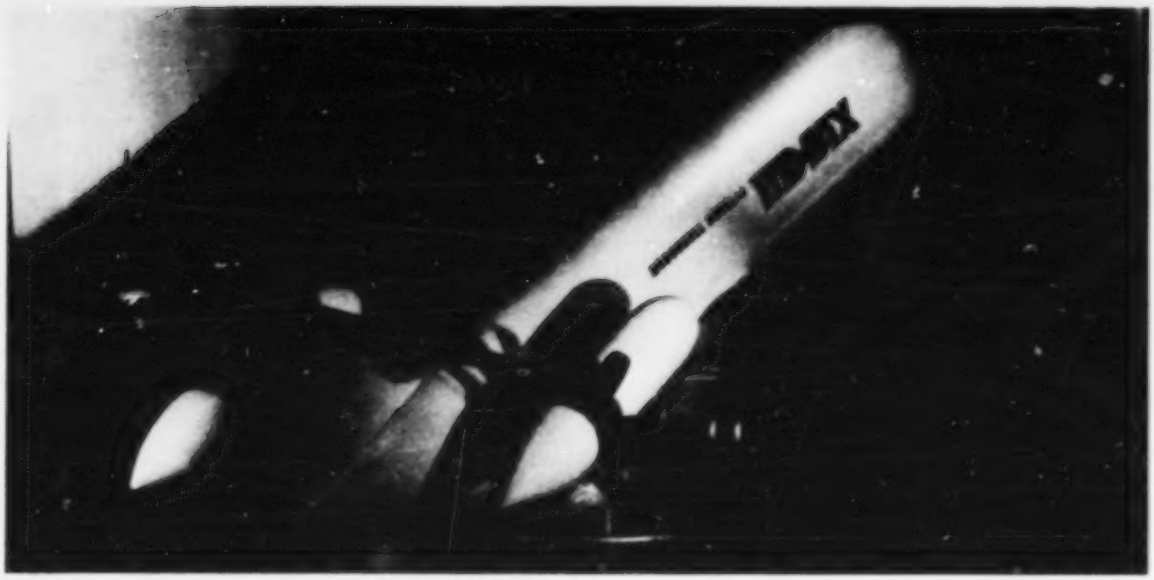


Figure 15. UHB Aerodynamics Technology

Figure 16. UHB Demonstrator Program

Figure 17. MD-91X: A UHB-Engine-Powered 110-Passenger MD-80 Derivative

Figure 18. MD-94X: A UHB-Engine-Powered New 150-Passenger Transport

Benefit Potential of Subsonic Transport Technologies - Technology advances will provide substantial benefits in new subsonic commercial transports introduced into service in the 1990's. Since fuel efficiency will likely grow in importance to DOC for transports introduced in the mid 1990's and later, potential fuel reduction is used here as one measure of relative benefit potential of the technologies just outlined. Figure 19 summarizes the fuel-reduction potential of these technologies in transports introduced to service in 1994 or 1995. Such timing assumes design methods, test data, and management confidence to support the particular application of each technology are in hand in 1990 or 1991.

Ultra-high-bypass (UHB) engines will already have been extensively applied in derivative aircraft, since their fuel-saving potential is very large. In new aircraft of the 1990's, they alone will contribute fuel savings of 35-40 percent relative to the best turbofan-powered aircraft of today.

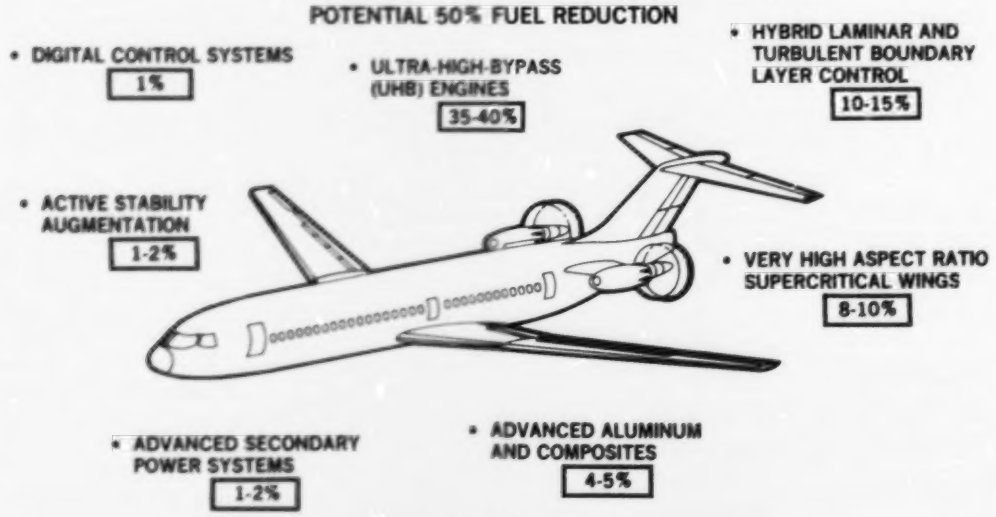


Figure 19. Emerging Subsonic Transport Technologies

Boundary layer control of both kinds will see its initial introduction in new transports of the mid 1990's. Laminar flow control will be applied in the "hybrid" form with suction in the wing leading edge and natural laminar flow over a portion of the upper surface. Thin plastic material with streamwise "riblets" will be applied to tail surfaces, wing undersurfaces, and probably to the fuselage surface. This combination of laminar and turbulent boundary layer control will substantially reduce drag for 10-15 percent fuel savings compared to aircraft without boundary layer control.

Very high aspect ratio supercritical wing geometries will increase lift-to-drag-ratio for 8-10 percent fuel savings relative to todays transports and weight reduction from application of aluminum lithium alloys and carbon fiber composites will reduce relative fuel consumption by 4-5 percent more.

Control and secondary power system advances of this time period will contribute only small fuel savings from modest weight and trim-drag reductions, but are essential features for saleable new transports of the future.

When this array of technologies is combined in a single aircraft of this period, the total fuel saving potential will be about 50 percent.

If we look further ahead to subsonic transports introduced in the year 2000 (with technology readiness in about 1996) additional fuel saving gains should be possible (Figure 20). Full upper surface laminar flow control will extend fuel savings from viscous drag reduction to 15-20 percent.

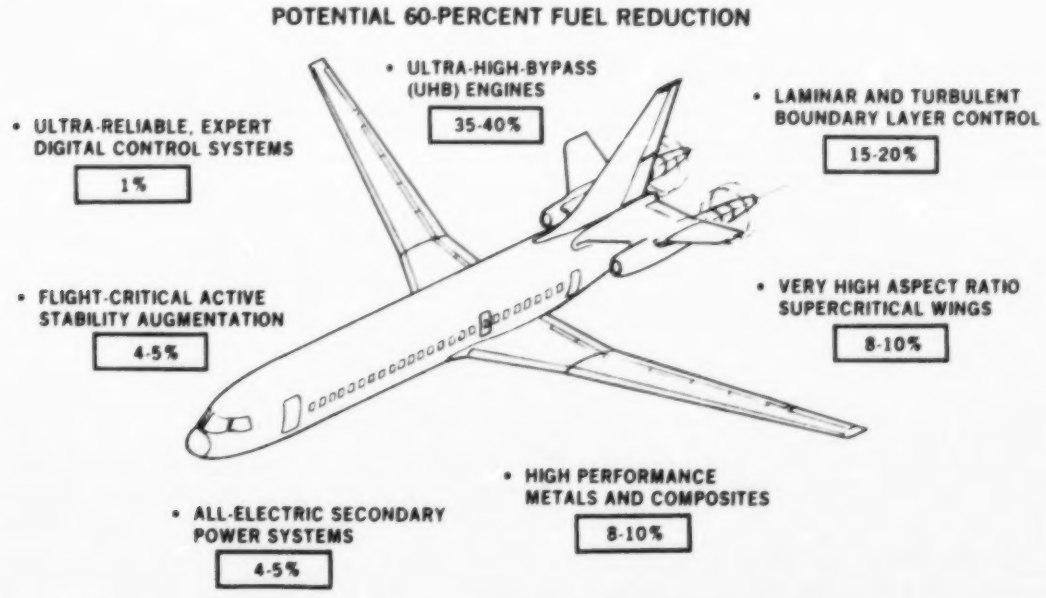


Figure 20. Year 2000 Subsonic Transport Technologies

More extensive application of composites, including high performance metal-matrix composites, will extend fuel savings from structural weight reduction to 8-10 percent. All electric secondary power systems will make possible reduced engine bleed as well as weight for as much as 4-5 percent fuel savings, and reliable active control systems will permit statically unstable systems for equivalent trim-drag and weight reductions. Total fuel saving potential of such technologies in year-2000 transports, relative to today is 60 percent.

OUTLOOK FOR HIGH SPEED CIVIL TRANSPORTS

While subsonic transports will still constitute most of the commercial transport fleets in year-2000, there is renewed interest in high speed commercial transports for long distance flights.

One option is supersonic flight at two to three times the speed of sound (Figure 21). Indeed, technology for advanced supersonic transports superior to the Concorde is well advanced. The example shown is a Douglas supersonic transport concept resulting from NASA's Advanced Supersonic Technology program of the 1970's.

Figure 21. Advanced Supersonic Transport

Another option is flight at even higher speeds -- four or more times the speed of sound -- frequently termed "hypersonic." The McDonnell Douglas concept shown in Figure 22 would cruise at five times the speed of sound and would have a range of 12,000 kilometers or 6,500 nautical miles. Its fuel would be cryogenic liquid methane -- i.e., liquid natural gas.

Such transports would cruise at altitudes of 100,000 feet or more and would generate sea level sonic booms only about half as strong

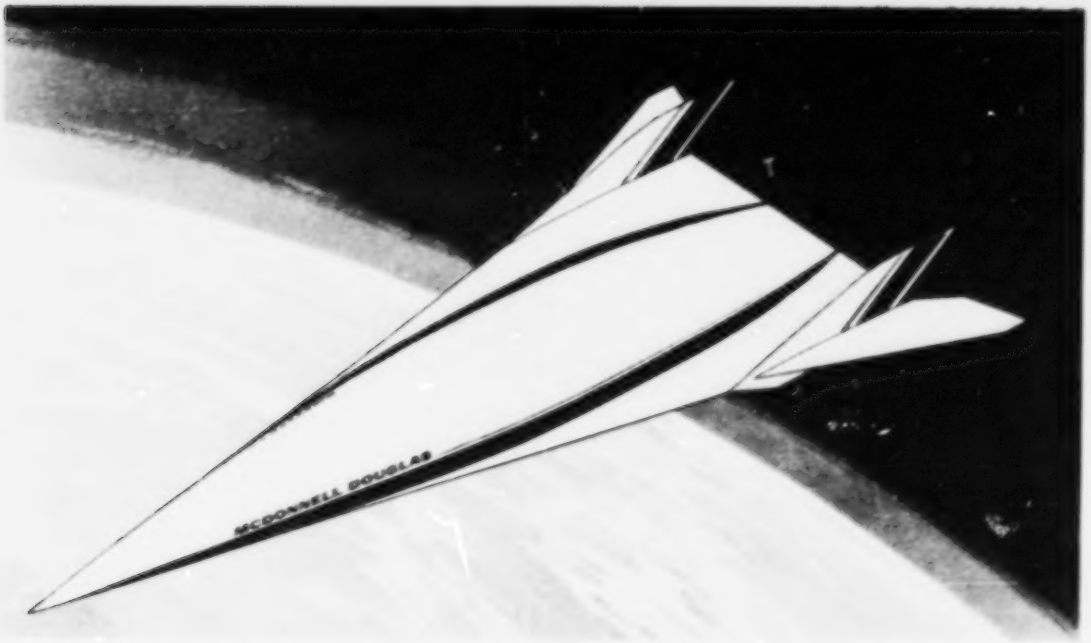


Figure 22. Mach 5 Liquid-Natural-Gas-Powered 6,500 N Mi Commercial Transport

as those generated by supersonic transports cruising at 65,000 feet. Hence, overland cruise may be environmentally acceptable for such hypersonic transports.

But economics will determine whether or not we will fly in such high speed commercial transports, how soon, and how fast. Such transports will cost more than subsonic transports to develop, produce, and operate; and these higher costs must be offset by higher income.

The higher income potential of such transports derives from their speed. Figure 23 is a plot of flight time (takeoff to touchdown) for a 6,500 nautical mile flight as a function of cruise Mach number. Time required for climb and descent is determined to limit acceleration and deceleration to 0.2g for passenger safety and comfort. Subsonic aircraft cruising at M=0.8 require 14 hours to complete such flights. With ground maneuver time, passenger loading and unloading, servicing, periodic maintenance, and the need to time departures with traffic demand, subsonic aircraft can average only one such trip per day.

Supersonic aircraft, cruising at M=2.2 for example, require about 5.5 hours and probably can average two such flights per day. The Mach five hypersonic aircraft requires about 2.5 hours for each such flight and, on average, would be expected to complete four such flights each day. Assuming equal numbers of passengers, load factors, fares, etc., its income production potential is twice that of the supersonic transport and four times that of the subsonic option.

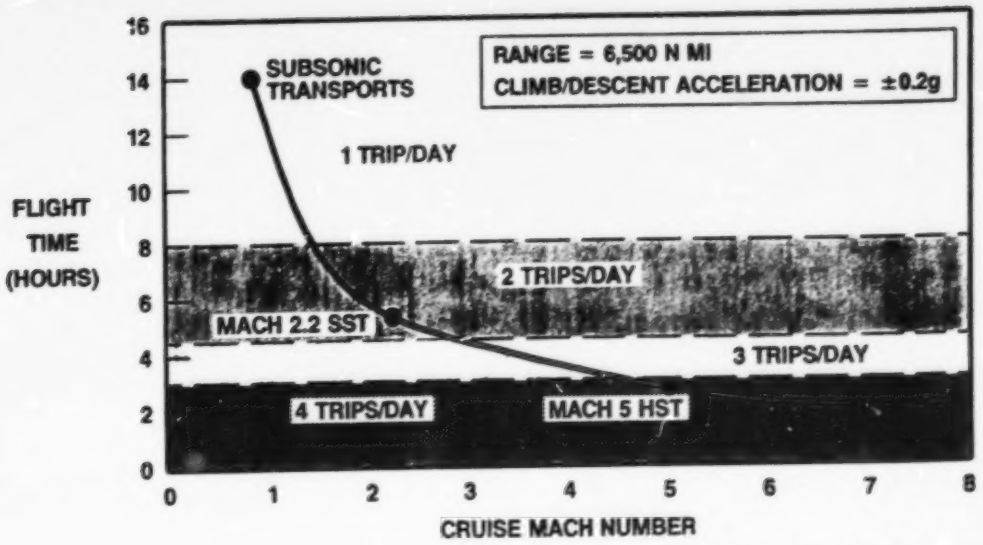


Figure 23. Subsonic Transports Flight Time versus Cruise Mach Number

But such productivity can only be realized if there is sufficient passenger demand. Such demand is thought most likely to result from growing commerce between the United States and the so-called "Pacific Rim" business centers of the Orient. As shown in Figure 24, flight distances for passenger traffic between centers of commerce and government in the United States and the Orient are indeed in the 6,000-6,500 nautical mile range.

Figure 24. Distances Between United States and Pacific-Rim Government and Commercial Centers

And air travel between the United States and the Orient is already increasing rapidly. As shown by the solid curve in Figure 25, this traffic increased over the 9-year period from 1975 to 1984 at an average rate of 11 percent a year to 6.4 million passengers a year. It now accounts for 41 percent of worldwide air traffic on flight segments of 4,500 nautical miles or more.

The dashed curve in Figure 25 shows McDonnell Douglas projections of traffic between the United States and Pacific Rim nations until the year 2020. These are based on year-by-year analysis to 1995, projected 10 percent per year growth from 1995 to 2002, and a gradual decline in growth to 7 percent per year by 2020.

From the year 2000 to 2020, this traffic is projected to range from 36 to 188 million passengers per year. By 2020, it will constitute 65 percent of the projected worldwide traffic potential on flight segments longer than 4,500 nautical miles. If one assumes a Mach 5 transport with 305 seats (Figure 22), four flights per day (Figure 23), and an average load factor of 75 percent, the number of such aircraft required to carry all the long range world-wide traffic projected for year 2020 is approximately 900.

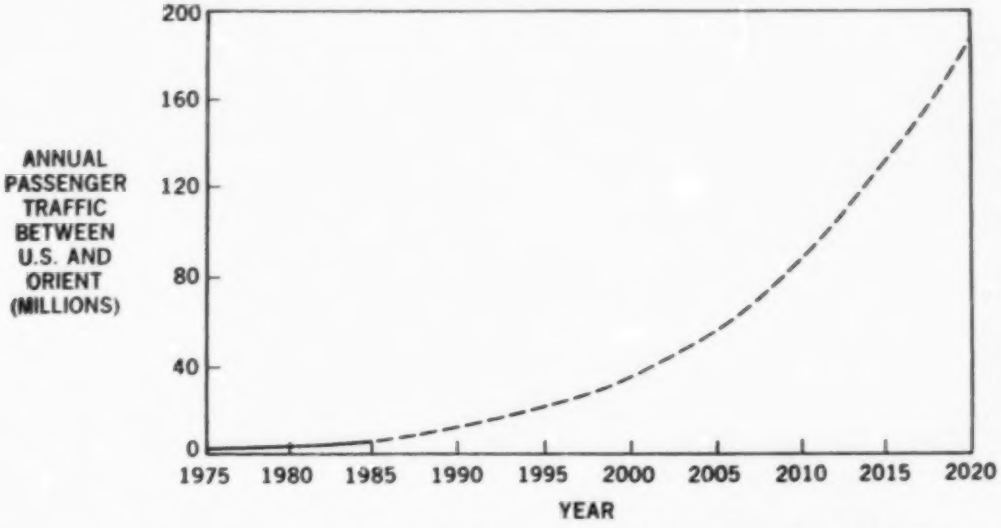


Figure 25. Recent and Projected Growth of Passenger Traffic Between the United States and Pacific-Rim Nations

Thus, a projected Mach 5 High Speed Civil Transport may have both a high income production potential and a substantial market potential. Its development and production costs -- hence, selling price -- cannot be firmly *known* for many years or even accurately projected without substantial analysis not yet accomplished. However, a rough-order-of-magnitude (ROM) evaluation of potential direct operating costs (DOC) for a range of vehicle prices has been accomplished and compared with corresponding DOC's for a 466-passenger 747-400. This evaluation was carried out for a four-flight cycle consisting of a Tokyo to Los Angeles round trip

followed by a Tokyo to New York round trip -- a total distance of 21,270 nautical miles. Liquid natural gas costs per BTU were assumed equal to JP4 costs (JP4, in turn, was assumed to cost $0.81/gallon). Cabin, crew, and insurance costs for the HSCT were increased 10 percent relative to 747-400 costs. Cockpit crew salaries were also set 10 percent higher although a back-up crew member was assumed for the 747-400. Maintenance cost parameters were tripled for the HSCT relative to the 747-400.

Results of this ROM evaluation of "relative" DOC are shown in Figure 26 as a function of "relative" price. By "relative" is meant the ratio of the HSCT value of DOC or price to the corresponding value for the 747-400. The plot on the right of this figure indicates that the HSCT may be priced at three times the 110 million dollar expected price of a 747-400 and still yield equivalent DOC per seat mile even though the 747-400 passenger capacity is 50 percent greater.

The plot on the left of Figure 26 shows relative trip costs indicating a 35 percent advantage for the HSCT priced at three times the price of the 747-400 and an 18 percent advantage even if the HSCT is priced five times the 747-400 cost, or 550 million dollars a copy.

The more comprehensive design and economic studies needed to evaluate the relative potential of various HSCT options and to confirm or deny these tentative conclusions are only now getting underway with NASA support. They will require some two years to complete.

The remaining questions concern technology readiness. As mentioned above, NASA's Advanced Supersonic Technology (AST) program of the 1970's did much to pave the way for flight at supersonic speeds. While steady advances in concepts and technology for higher speed flight have also been made since the 1960's, much remains to be accomplished in such areas as multi-cycle engine

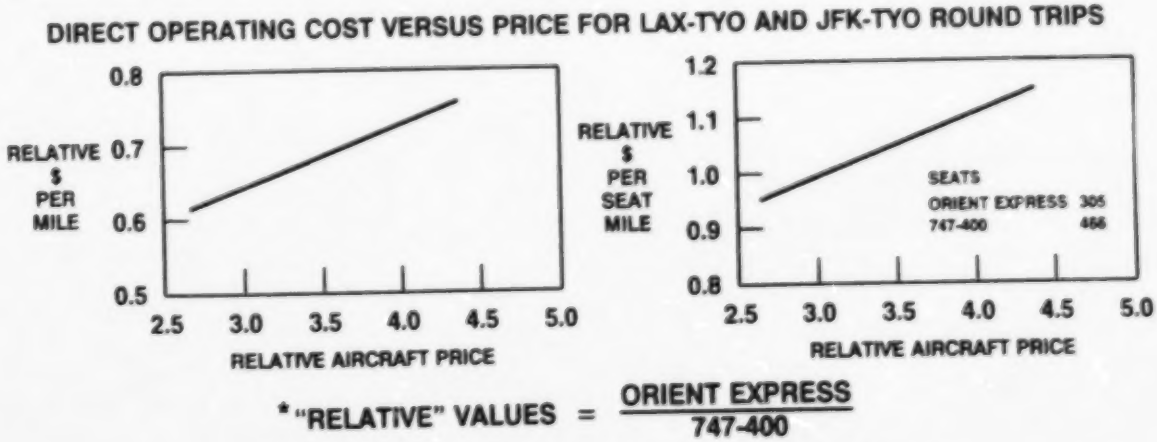


Figure 26. Mach-5 Orient Express Relative* to the 747-400

designs, materials and cooling concepts for engine and airframe structure, overall thermo-structural design concepts for integration of hot structure and cryogenic fuel tanks with cockpit and cabin areas, etc. Comprehensive technology development and demonstration efforts, now being funded by the U.S. Government for a so-called National Aerospace Plane (NASP), will spin-off many of these solutions.

SUMMARY

Fuel costs are now expected to remain low until the mid-1990's and only gain slowly on general inflation thereafter. Since interest is expected to hover around 10 percent, capital investment will dominate airlines DOC for many years to come.

Therefore, near term DOC advantage is seen for derivatives of current products with selective application of key technologies whose fuel saving, performance, or sales appeal benefits are sufficient to offset their cost impact. Key technologies for near term application include Ultra High Bypass (UHB) -- i.e., propfan -- engines, replacement of current aluminum in primary structure with aluminum lithium alloys as production quantities of these become more available, application of advanced composite materials in secondary and lightly loaded primary structure, and advanced two-man cockpits with digital processing and display of flight information.

The earliest that combined technology payoffs appear sufficient to justify the cost of a new aircraft is the mid-1990's. However, by year 2000, fuel efficiency will have regained some of its importance in airline operating costs and very substantial gains, relative to todays best turbofan-powered aircraft, will accrue from technology.

Digital control systems will have been made ultra reliable and fault tolerant with sufficient "artificial intelligence" to function as a "pilot associate" and assist the crew in their monitorship and flight management functions. Fiber optics will have replaced wires for signal immunity to electromagnetic interference and modest weight savings worth about 1 percent fuel savings.

Reliability of these systems will safely permit flight-critical "active control" functions, including stability augmentation with small horizontal tail surfaces and statically-unstable load distributions for reduced trim drag and up to 5 percent fuel savings. And, electro-mechanical or electro-hydraulic actuation of control surfaces will permit all-electric secondary power systems that reduce weight and eliminate engine bleed for another 4-5 percent fuel savings.

By 2000, low cost manufacturing methods will have made composites more economical, and high-performance composites, with polymer and aluminum-lithium matrices will combine to provide stiff, damage tolerant, high-load-carrying wing and fuselage structures for 25 percent overall weight saving and 10 percent fuel reduction. Such composite wing structure, combined with active wing load alleviation, active flutter suppression, and thick advanced airfoil sections, will enable very-high-aspect-ratio, fuel efficient wings worth another 10 percent in fuel savings.

Another 20 percent fuel efficiency gain will be possible via the first practical methods of boundary layer control for viscous drag reduction. McDonnell Douglas has already demonstrated that boundary layers on upper-wing and empennage surfaces may be kept laminar via suction through perforations in the skin and NASA research suggests turbulence in fuselage and lower wing surface boundary layers will, by the year 2000, be limited by fine streamwise riblets on the external skin surface.

Finally, fuel efficient ultra-high-bypass engines will have been extended to large sizes and high subsonic cruise speeds suitable for large, long-range transports. These alone will reduce fuel consumption by 35-40 percent compared to current turbofan transports.

If all these technology advances are combined in a single, new subsonic transport, the resulting *total* fuel savings will exceed 60 percent. This is a productivity gain of more than 150 percent.

While subsonic aircraft will still dominate commercial fleets in the next century, high speed civil transports for non-stop flights up to 6,500 nautical miles are currently under evaluation. Their economic viability is dependent on high income potential due to speed. While sufficient traffic volume is foreseen to employ a large fleet of even Mach 5 transports, their cost to develop and produce still must be determined to assess their economic viability and potential. However, initial ROM analysis suggests they can cost several hundred million dollars each and remain profitable.

AERO ENGINE

Gerald L. Brines

Manager, Advanced Engine Programs,
Pratt & Whitney

Biographical Highlights:

Mr. Brines graduated in 1956 from Lawrence Institute of Technology with a BSME degree. He worked as a Research Engineer at North American Aviation in Los Angeles from 1956 to 1960 and did graduate work at UCLA. In 1960, he joined Pratt & Whitney in Connecticut where he has worked on both military and commercial programs. During 1966-68, he was Manager of the FX Study Program which led to the selection of the F100 engine cycle for the F-15 aircraft.

He was also Program Manager on both the Eastern Airlines and American Airlines STOL Transport Studies for the Northeast Corridor as well as the NASA Advanced Transport Technology Program. In 1976, Mr. Brines was transferred to Pratt & Whitney's Florida facility as Manager of the Air Force Advanced Tactical Fighter and Navy Type A V/STOL Studies. In 1977, he returned to Connecticut as Manager, Product Planning, in Pratt & Whitney's Group Strategic Planning Organization. Then, in 1983, he transferred back to the Engineering Division as Manager, Advanced Engine Programs.

THE NEXT GENERATION...1990'S AND BEYOND

Gerald L. Brines
Manager, Advanced Engine Programs
Pratt & Whitney
United Technologies Corporation

The next generation of commercial transport engines being studied for the 1990's and beyond offer exciting fuel reduction potential. Figure 1 traces the historical trend in cruise specific fuel consumption from the first commercial turbojet (JT3C) of the late 1950's, through the low bypass ratio turbofans (JT3D, JT8D) of the 1960's to the high bypass ratio engines (JT9D, PW2037 and PW4000) of today. The curve in Figure 1 indicates a leveling off in the fuel reduction potential of conventional high bypass ratio turbofans certificated in the 1980's when compared with the dramatic improvements already achieved. However, the next generation of commercial transport engines for the 1990's and beyond offer a significant potential for reducing fuel consumption even further.

Pratt & Whitney is conducting a technology readiness program on two rather unconventional propulsion concepts, as shown in Figure 2, in order to establish the necessary technology base required to launch these very high bypass ratio engines when the marketplace demands it. The upper photos depict two different arrangements of the high speed (Mach 0.8) Prop-Fan. The Prop-Fan utilizes very thin, highly swept, counter-rotating variable pitch propellers resulting in a highly efficient propulsor with a bypass ratio up to 80 compared with around 6 for today's turbofans. The higher the bypass ratio, the more fuel efficient the engine is.

The concept shown in the upper left of Figure 2 has the props mounted on the front of the engine (tractor arrangement) and is being studied for military transports with the engines mounted on the wing. Wing mounting the engines provides the added benefit of the propeller slipstream enhancing the lift of the wing resulting in shorter takeoff and landing distances. The picture in the upper right shows the props mounted on the rear of the engine (pusher arrangement) currently favored in the studies of 100-180 passenger commercial transports. This arrangement permits mounting the engines on the rear of the fuselage behind the passenger cabin for minimum noise.

The Advanced Ducted Prop concept shown in the center of Figure 2 combines some of the design features of the Prop-Fan (high bypass ratio and gear driven, variable pitch blades) with that

of conventional turbofans (ducting around the blading). The Advanced Ducted Prop engine is intended for long range, higher speed transports with cruise Mach numbers up to 0.9. The smaller diameter ducted prop is also more compatible with wing mounted installations typical of long range aircraft than the unshrouded Prop-Fan. Bypass ratios of 15-20 are currently being evaluated.

Figure 3 presents the reductions in fuel burn and direct operating cost anticipated with the Advanced Ducted Prop and Prop-Fan concepts. The higher bypass ratio, more efficient Prop-Fan could provide 25-30 percent reduction in fuel burn and 6-7 percent better operating cost when compared with a conventional bypass ratio 6 turbofan of comparable technology level. The Advanced Ducted Prop would reduce fuel burn 15-20 percent and direct operating cost 4-5 percent. The expanded direct operating cost used here includes both depreciation as well as the cost-of-capital to purchase the aircraft. Even a one percent reduction in direct operating cost is extremely significant to an airline. Therefore, the potential economic benefits of these new engine concepts have created a lot of interest within the airline industry.

Favorable reaction by the industry has resulted in many options being evaluated, (Figure 4). Engine companies are studying both geared and gearless concepts to drive the props as well as shrouded and unshrouded props. Aircraft companies are assessing both derivative models of current turbofan powered transports as well as all-new high technology designs. Airlines are beginning preliminary fleet planning to ascertain the impact these fuel efficient concepts would have on future operations.

Figure 5 illustrates some of the key features of the geared Prop-Fan concept being studied by Pratt & Whitney. The gas turbine engine that drives the Prop-Fan could be either a derivative of an existing engine or an all-new engine. Presently, Pratt & Whitney is teamed with the Allison Division of General Motors to develop a Prop-Fan propulsion system based on a derivative of the Allison T701 from the Heavy Lift Helicopter program of the U.S. Army that was cancelled a few years ago. The most significant feature is the advanced technology gearbox that permits the power turbine to turn at high speeds which is optimum for performance and at the same time enables the prop to turn at a much lower speed that maximizes prop performance and minimizes noise.

Of course, the feature that is strikingly different from today's engines is the large diameter, highly swept, counter-rotating Prop-Fans being developed by Hamilton Standard. These advanced props maintain high efficiency up to the same cruise Mach number of today's short to medium range jet transports.

The capability of the gear driven system to maximize the efficiency of each component results in significant benefits compared to a direct drive concept (Figure 6). Peak efficiency results in the lowest fuel burned, lowest noise, lowest direct operating cost and lowest risk Prop-Fan system.

Both Pratt & Whitney and Allison have NASA contracts to investigate advanced technology, high horsepower gearboxes with efficiencies over 99 percent (Figure 7). High reliability will result in over 30,000 hours between unscheduled removals.

The Prop-Fan concept offers the potential of a major improvement in the short to medium range transport of the 1990's.

Figure 8 illustrates the main features of the Advanced Ducted Prop. As with the Prop-Fan, the high bypass ratio, variable pitch prop is driven by a gear system to maximize component efficiencies. The variable pitch feature permits thrust reversing, thereby eliminating the need for a conventional reverser located in the nacelle. Elimination of the reverser along with advanced aerodynamics permits the design of a short, thin, "slim-line" nacelle that minimizes nacelle weight and drag. An additional feature of the slim-line nacelle is the external cowl mount location. This eliminates the need for a pylon bifurcation in the exhaust duct that would create unacceptable performance loses for the high bypass ratio concept.

Initial applications of the Advanced Ducted Prop could be on long range twin and four engine aircraft with wing mounted installations as shown in Figure 9. One technical challenge will be the integration on the wing of the large diameter nacelles associated with the high bypass ratios.

When will these next generation engines be available? Technology programs are in place to provide technology readiness for the Prop-Fan by the end of 1987. This would permit launching an engine development program in January, 1988 with certification by the end of 1990. Aircraft certification would occur about a year later. The Advanced Ducted Prop certification would follow the Prop-Fan sometime in the mid 90's as shown on Figure 10.

The most dramatic part of the Prop-Fan technology readiness program will be the large scale flight demonstration programs scheduled for 1987. The first flight test will occur early in 1987 on board a modified Gulfstream II. This is a NASA sponsored program being conducted by Lockheed-Georgia Company to test a single-rotation, 9 foot diameter wing mounted tractor Prop-Fan designed and built by Hamilton Standard. The prop is driven by an Allison T701 gas turbine in combination with a modified T-56 gearbox as shown in Figure 11. This test will

verify the acoustics and structural design criteria of the prop from takeoff to Mach numbers in excess of 0.8.

The second flight test program scheduled for December, 1987 is a joint Pratt & Whitney, Allison, Hamilton Standard program in conjunction with McDonnell-Douglas. This program will test an 11.6 foot diameter, counter-rotating pusher Prop-Fan mounted on the aft fuselage of a McDonnell-Douglas MD-80. This test will demonstrate the near field (cabin noise) and far field noise characteristics of the counter-rotation Prop-Fan. Critical airframe/engine integration testing will also be conducted to verify the engine location currently favored in the 100-180 passenger transport studies.

A ground demonstrator program is already being planned for the Advanced Ducted Prop concept to verify all of the unique design features of that propulsion concept.

We are on the threshold of the ultra high bypass ratio era that will usher in yet another giant leap forward in fuel efficient turbine engines for tomorrow's commercial airliners.

References:

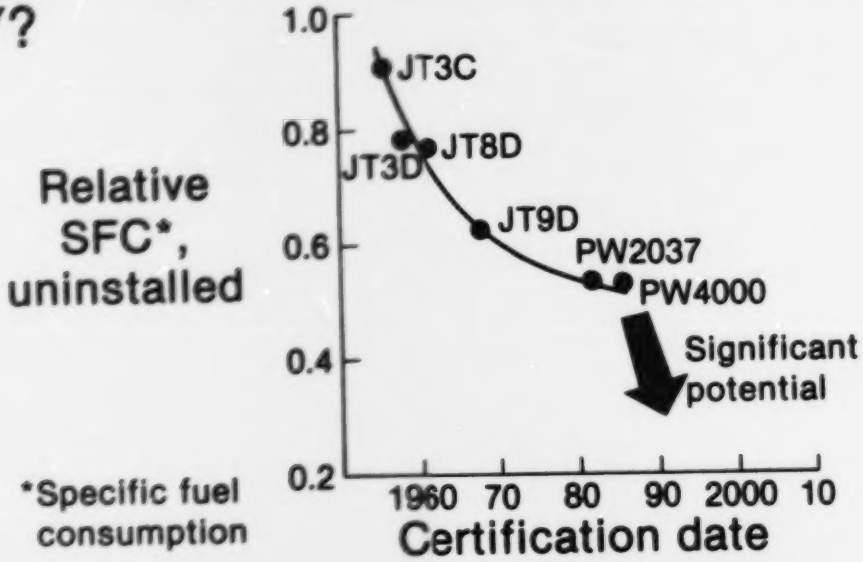
T.A. Domagala, January 13-14, 1986; The Next Generation...by Pratt & Whitney; Asian Aerospace Technology Symposium '86, Singapore.

T.A. Domagala, February 17-18, 1986; Aero Engines of the Future, Civil Aviation in the Middle East, Dubai, United Arab Emirates.

(FIGURE 1)

NEXT GENERATION ENGINES

WHY?



*Specific fuel consumption

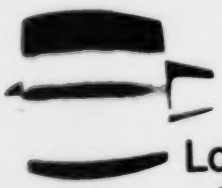
(FIGURE 2)

PRATT & WHITNEY PLAN

TECHNOLOGY READINESS

Military

100-180 passengers

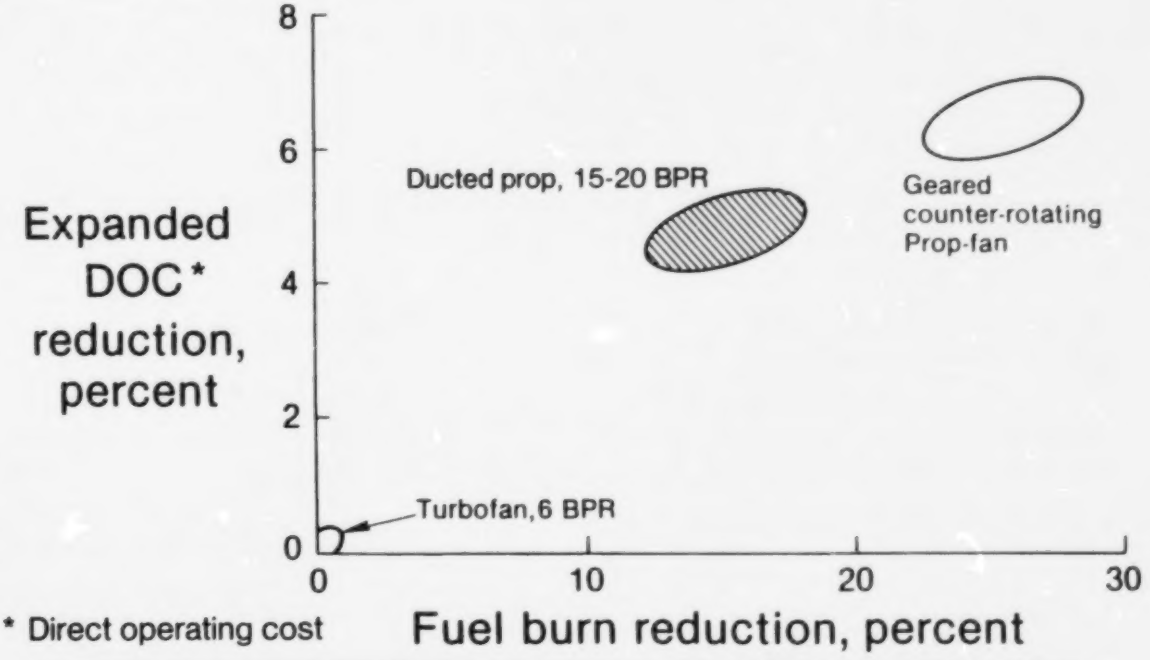


Long range, wing mounts

(FIGURE 3)

NEXT GENERATION ENGINES

ECONOMICS

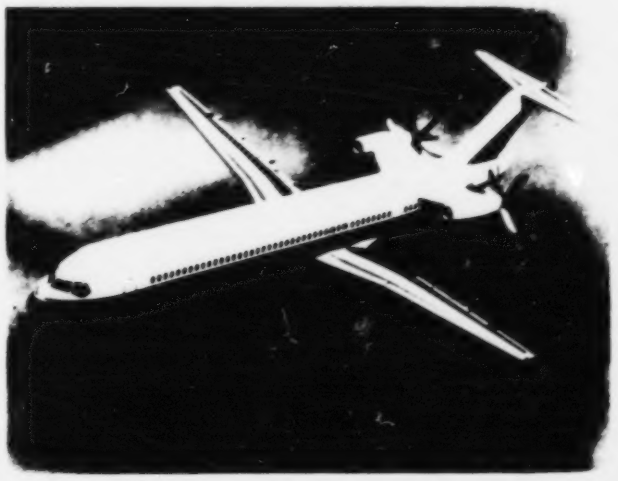


(FIGURE 4)

INDUSTRY REACTION

MANY OPTIONS

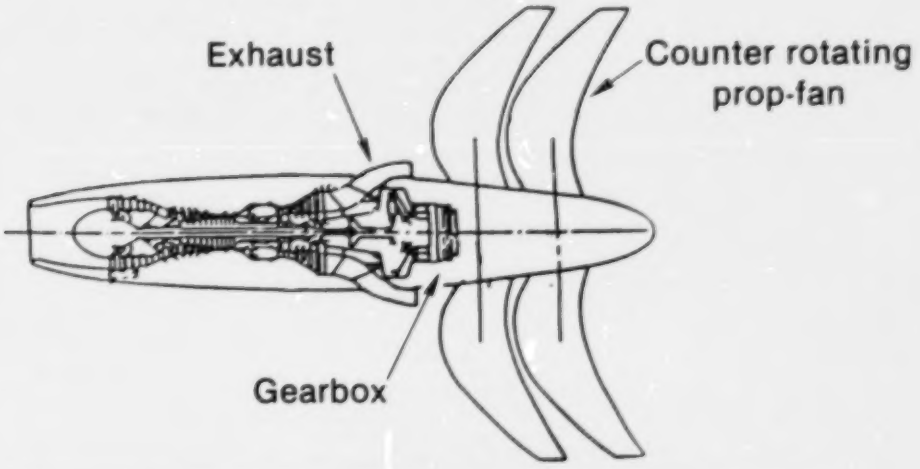
- Engine concepts/ variations
- New/derivative aircraft
- Fleet planning



(FIGURE 5)

PROP-FAN

FEATURES



(FIGURE 6)

GEARED SYSTEM SELECTED OVER DIRECT DRIVE

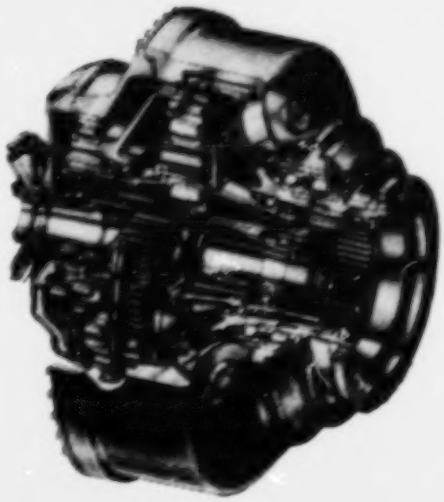
- Tractor or pusher flexibility
- Lowest fuel burned
- Lowest direct operating cost
- Lowest acoustic levels
- Lowest risk open rotor

(FIGURE 7)

GEARBOX PROGRAM

RELIABILITY ENSURED

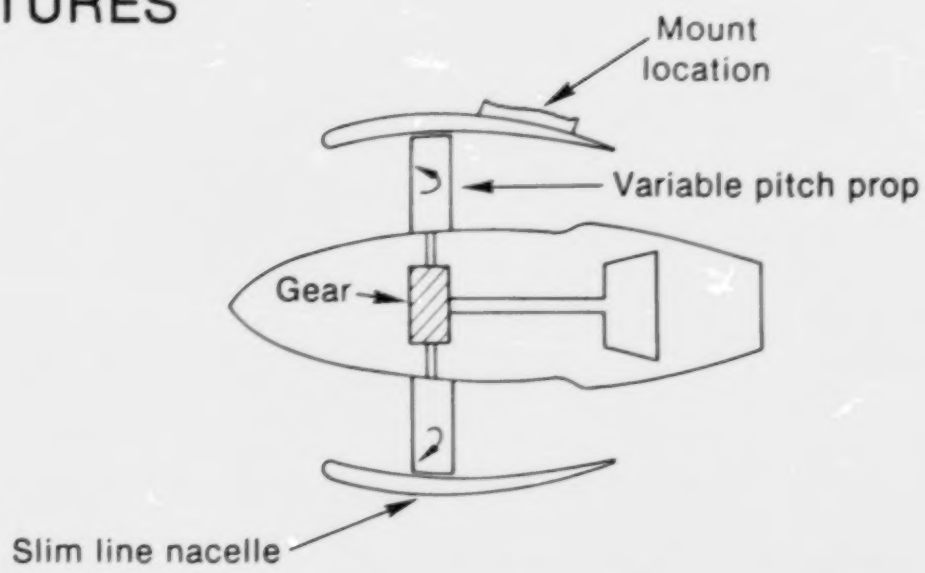
- 12,000 SHP gear
- 30,000 hours between unscheduled removals
- High efficiency



(FIGURE 8)

ADVANCED DUCTED PROP

FEATURES



(FIGURE 9)

ADVANCED DUCTED PROP

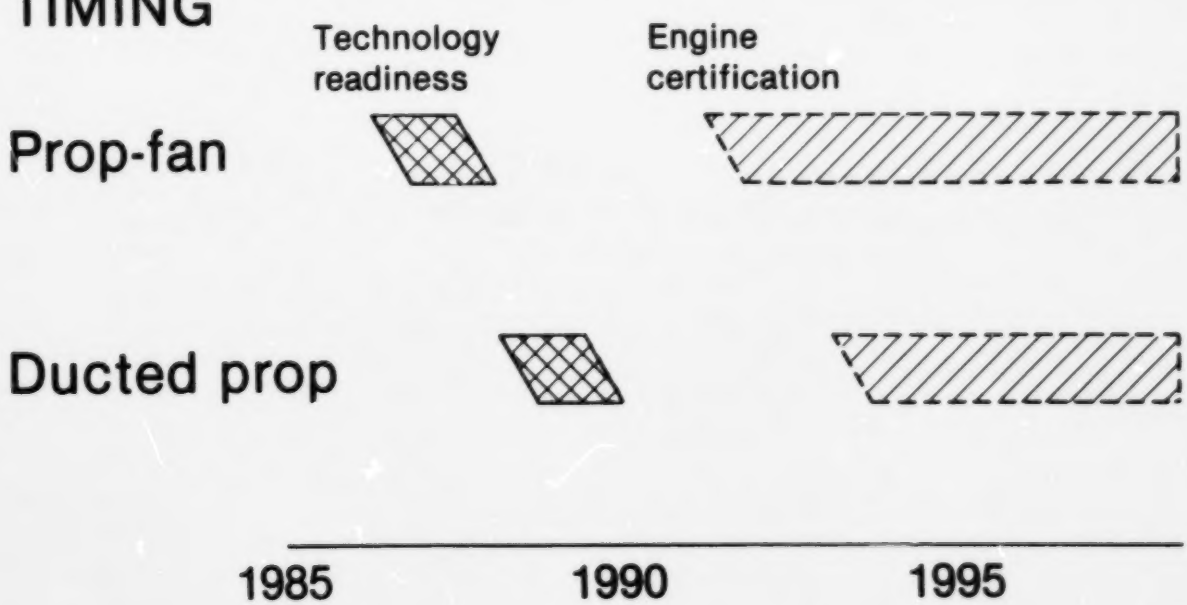
APPLICATIONS

- Long range market
- Under-the-wing derivative aircraft

(FIGURE 10)

PRODUCT PLAN

TIMING



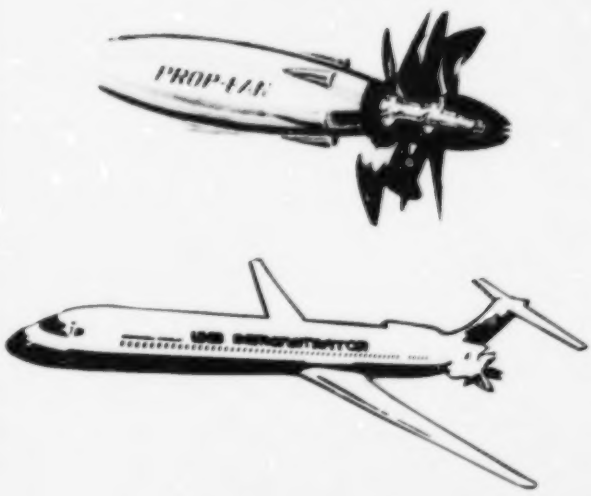
(FIGURE 11)

FLIGHT PROGRAMS

NASA/Lockheed
Prop-Fan test assessment

Prop-Fan research

Allison/Pratt & Whitney
Hamilton Standard
Douglas Aircraft Co.

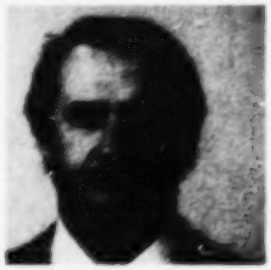


Propulsion system
and airframe integration technology

TURBO PROP AIRCRAFT

Bruno B. Diesner

Economist,
De Havilland Aircraft of Canada



Biographical Highlights:

Mr. Diesner joined de Havilland in 1979 as an economic analyst in the Marketing Department.

Prior to joining de Havilland he had worked for the Ontario Government in a research capacity and Canada Wire and Cable as a marketing analyst.

Mr. Diesner holds an Honours B.A. and M.A. degrees in Economics from Wilfred Laurier University and The University of Waterloo and has recently completed his studies at York University for an M.B.A.

He holds a Private Pilot Licence and is a member of a sub-committee on regional/commuter aviation affiliated with the Transportation Research Board in Washington, D.C.

FUTURE PROSPECTS FOR TURBOPROP AIRCRAFT IN CANADA

BRUNO B. DIESNER
ECONOMIST
DE HAVILLAND AIRCRAFT

INTRODUCTION:

My objective here today is to profile the state of the regional/commuter airline industry in Canada as it relates to:

- Operating environment
- Type of equipment
- Future aircraft requirements
- Technological developments.

I feel my presentation is timely with deregulation in Canada nearing reality and with restructuring of the airline industry going into high gear.

The first part of my presentation profiles the regional/commuter airline environment in both Canada and the U.S. and includes a pre-assessment of the pros and cons of deregulation in Canada.
Part two addresses the subject of future aircraft requirements and includes an overview of de Havilland's forecasting methodology as well as fleet and delivery projections for the turboprop airline market in Canada.

Part three focuses on innovative designs and future technological developments in turboprop aircraft incorporating some new de Havilland products.

I. REGIONAL/COMMUTER AIRLINE PROFILE

In order to understand the domain of the short-haul airline market, one must first of all have some conception of what a commuter airline is.

A basic definition of this market segment is that a commuter airline is typically a feeder or air taxi operator which:

- Operates fixed wing piston or turboprop aircraft in the 10 to 70 passenger range;
- occasionally operates small jet equipment as part of the propeller fleet;
- typically operates on segments of between 100-300 statute miles;

- ferries passengers between smaller community airports or to major hubs to link up with jet carriers;

- serves both high and low density markets;

- competes head on with auto, rail and bus.

Figure 1 gives some examples of Canadian and U.S. regional/commuter operators.

REGIONAL/COMMUTER ENVIRONMENT: CANADA VS U.S.

The operating environment of today's regional/commuter airlines differs with regards to Canada and the U.S.

In Canada, the majority of the population and major city centres are within close proximity to the Canadian U.S. border whereas in the United States, the major population centres are more evenly spread out, especially along the eastern seaboard.

This demographic climate makes it difficult for Canadian commuters to effectively penetrate the northern regions of Canada's provinces as a feeder line to major trunk carriers.

In the U.S. however, the densely populated areas lend themselves well to hub and spoke operations so commuters can feed traffic to major carriers. This accounts for the fact that around 80% of U.S. commuter traffic connects to longer jet routes while in Canada only 25% is of this kind.

Another factor to consider is the differences in capital availability, leasing and financing options in the two countries.

In the U.S. many of the larger regional/commuter airlines have access to equity market financing, international leasing, and with the growing trend towards mergers and affiliations, have the financial support of large trunk operators behind them.

In Canada, financing availability for commuter operators has been limited to debt financing by way of government assistance programs due the lack of sufficient collateral by many of the medium and smaller commuters to merit sizeable advances by lending institutions and the resistance of the equity market to consider aircraft financing as a viable alternative. Leasing arrangements are possible but less accessible to Canadian operators than U.S. counterparts.

Size and magnitude are also important criteria since in the U.S. in 1984 there were 200 regional/commuter carriers which ferried 26 million passengers while in Canada during the same period, level II-IV carriers totalled 40 and carried close to 4 million passengers.

What this all signifies is that the Canadian regional/commuter operator has some distance to cover to bring himself in line with his U.S. counterpart and deregulation in Canada may therefore follow a different path than that of the U.S. experience.

Under the present regulated environment many inefficiencies have been cited such as inappropriate matching of aircraft to route segment, infrequent service to smaller communities, lack of competitive marketing strategy within the airline system and lack of incentives for new airlines to develop.

Under deregulation the following benefits are possible:

- Route and equipment rationalization such as removal of jets from unprofitable routes;
- Equity involvement by majors into regionals;
- Acquisition of new turboprops offering "jet style service";
- Emergence of new airlines and alliance partnerships;
- Improved efficiency and lowering of overhead costs;
- Increased frequency & better scheduling;
- Emergence of flexible fare structures.

Some disadvantages might include:

- Possible loss in service to remote communities without subsidization;
- Loss of identity and autonomy of regional/ commuters through merging with majors;
- Increased risk to unaligned carriers unless specialized in terms of service availability.

II AIRLINE MARKET AND FLEET FORECAST

Having briefly discussed some characteristics of regional/ commuter operators in Canada and the U.S., I now wish to address the subject of forecasting.

In this section, I propose to review de Havilland's methodology for forecasting the 15-70 passenger turboprop airline market, followed by a fleet and airline delivery forecast for Canada for the 1987-1996 time period.

Methodology:

Figure 2 illustrates our basic approach to forecasting which involves the top-down method incorporating macro economic and passenger traffic variables to project aircraft and fleet requirements.

The market segments are divided into airline, corporate/ resource and military and cover the U.S. and the rest of the world.

The U.S. is forecast separately due to the availability of more current and relevant information such as commuter passengers, RPM traffic, average stage length, load factors and utilization rates.

The rest of the world is divided into six major economic regions which include Canada, Latin America and Caribbean, Europe, Africa, Middle East, and Asia and the Pacific.

Figure 3 details the basic steps in the forecasting exercise.

Regression models are generated for each region using historical RPKs (or RPMs in the case of U.S.) GNP and CPI to achieve the best fit possible.

Projections of the macro-economic variables are then applied to the individual regression equations to yield an RPK forecast. This is applied to base fleets in all three size categories to generate a projection for growth in fleets by aircraft size. Some external forecasts incorporate passenger yields or ASMs (available seat miles) but we have found RPKs to give us the highest correlation co-efficients and statistically the best fits.

Assumptions are also made regarding fleet retirement rates, new to used aircraft purchase ratios, and jet penetration to yield net new aircraft demand.

Our expected market shares are then applied to reveal our anticipated product sales.

CANADIAN AIRCRAFT REQUIREMENTS FORECAST

Basic macro assumptions

With regards to the Canadian forecast, Figure 4 outlines some of our basic assumptions regarding the future state of the economy and passenger traffic. These include:

- forecast of 2.5% average annual growth for the Canadian economy through 1996;
- Canadian domestic and international RPKs projected to increase by 5% per year on average over this period;

- slight chance of U.S. recession in 1987 if consumer and trade sectors stagnate;

- aviation fuel prices expected to remain flat through to 1990 and then increase by 2% on average in real terms per year to the end of the decade;

- effects of Canadian airline deregulation not included in forecast due to too many unknowns.

Chart 1 illustrates our forecast for Canadian RPK growth over the forecast timeframe as well as some historical series.

Chart 2 shows the 1984 base fleets for U.S. and Canada for comparison purposes. You can see that overall, the U.S. commuter airline fleet is over three times the size of Canada's with the largest variance in the 19-passenger category.

Chart 3 presents our Canadian fleet forecast for 1996 for 19, 30 and 50 passenger aircraft markets and compared to 1987 shows the most significant changes anticipated for the 15-19 and 20-39 passenger markets.

NORTH AMERICAN TURBOPROP AIRLINE MARKET FORECAST: 1987-1996

Figure 5 depicts de Havilland's airline delivery market forecast for the 15-19, 20-39, and 40-70 passenger turboprop markets for both Canada and U.S.A. In total, the projected aircraft requirements for the U.S. commuter airlines is almost 10 times the anticipated requirement for the Canadian segment of the market.

This is in line with U.S. GNP and population figures which are also approximately 10 times the size of Canada's.

Throughout this period new aircraft acquisition in Canada is expected to account for 36% in the 15-19 passenger category and 50% and 30% in the 20-39 and 40-70 seat categories respectively.

III FUTURE DEVELOPMENTS IN COMMUTER AIRCRAFT TECHNOLOGY

Proposed innovations in commuter aircraft technology offer a variety of new features as shown in Figure 6.

The development of advanced engine and wing designs offer cruise speeds approaching 350-360 knots. In addition the use of advanced materials such as aluminium lithium alloys, kevlar/graphite on secondary and primary structures and arall are designed to reduce drag and weight and increase speed.

In terms of thrust and propulsion, new designs in propeller technology such as high disc loading turbo-propellers and propellers with contra-rotating blades offer faster speeds and greater efficiency than conventional propeller designs.

Figure 7 illustrates some examples of new technology in this field. Although prop fan designed engines are in the experimental stage, their application for commuter aircraft in the 15-70 passenger range is limited due to the high development costs associated with their application for this market. Their focus is presently towards larger aircraft in the 85-100 seat range where speeds in excess of mach 0.8 are appropriate for longer stage lengths these type of aircraft are usually flown on.

Other options for improved performance include fully powered flying controls, gust alleviation and ride control, and fully electronic cockpits.

DE HAVILLAND PRODUCTS

de Havilland Aircraft's new family of products includes the Dash 8 S.100, a 36 passenger turboprop and the new Dash 8 S.300 Series passenger configuration due to fly in early 1988.

Figure 8 provides some of the technical specifications including speed ranges, weight, and take-off runway length.

Applications:

As shown in Figure 9, the applications for the Dash 8 Series of aircraft extend beyond airline designation to include maritime reconnaissance, military, utility, corporate and resource fields.

DASH 8: THE RIGHT CHOICE

Figures 10 and 11 provide some performance data on the Dash 8 100 and300 Series to illustrate their ability to complement the demands of today's regional commuter airline operators and passengers.

SUMMARY:

In closing, I hope I have left you with some conception of what the future for the commuter airline industry in Canada might hold, and broadened your understanding of this dynamic and highly innovative aircraft environment.

FIGURE 1

SOME EXAMPLES OF REGIONAL/COMMUTER OPERATORS:

CANADIAN CARRIERS

LEVEL II - IV
AIR ONTARIO
NORONTAIR
CITY EXPRESS
AIR B.C.
TIME AIR
AIR ATLANTIC
BRADLEY AIR SERVICES
AUSTIN AIRWAYS
LABRADOR AIRWAYS

U.S. CARRIERS

PART 298
RANSOME AIRLINES
HENSON AIRLINES
PILGRIM AIRLINES
BRITT AIRWAYS
AIR WISCONSIN
AIR MIDWEST
HORIZON AIR
METRO AIRLINES
PENNSYLVANIA AIRLINES

FIGURE 2

TOP-DOWN FORECAST COMPONENTS

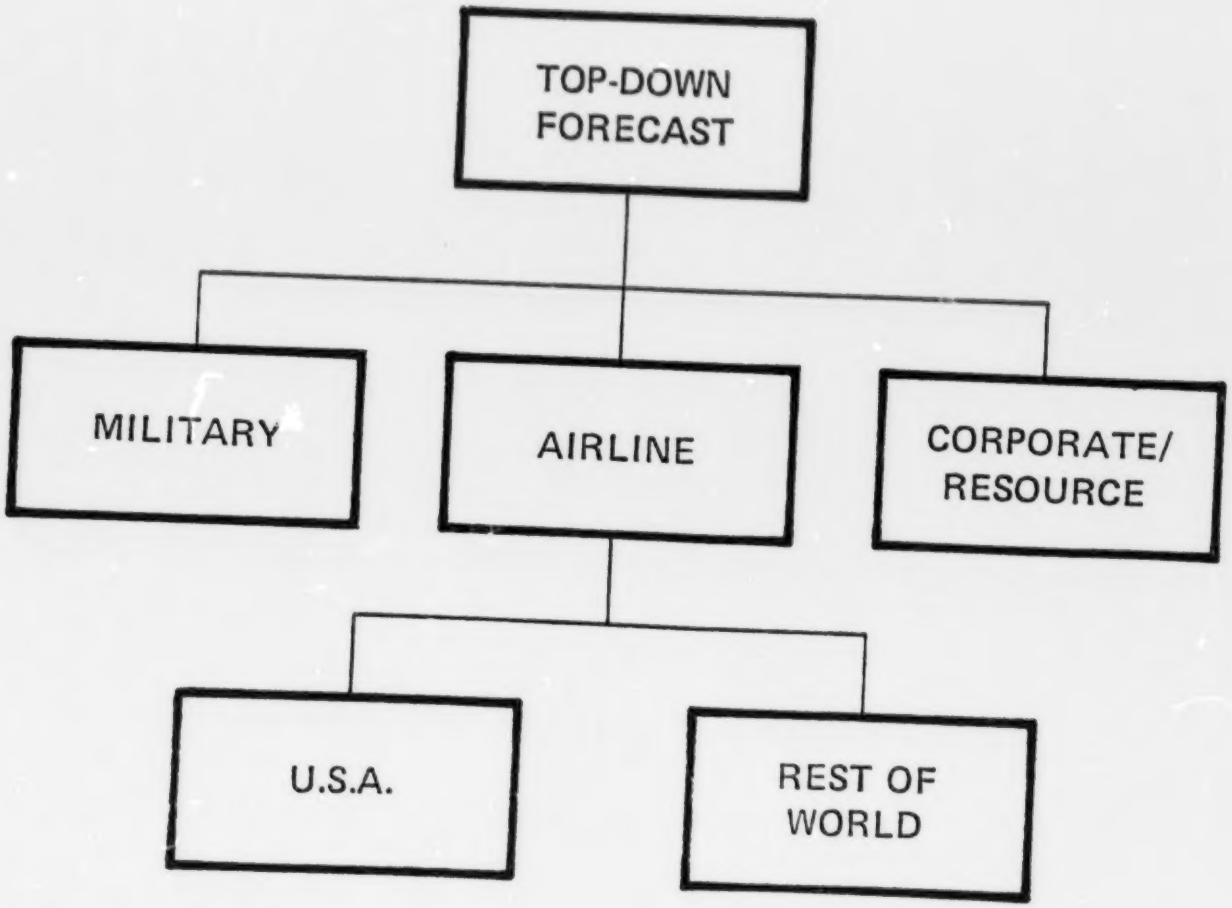


FIGURE 3

AIRLINE FORECAST FLOW CHART

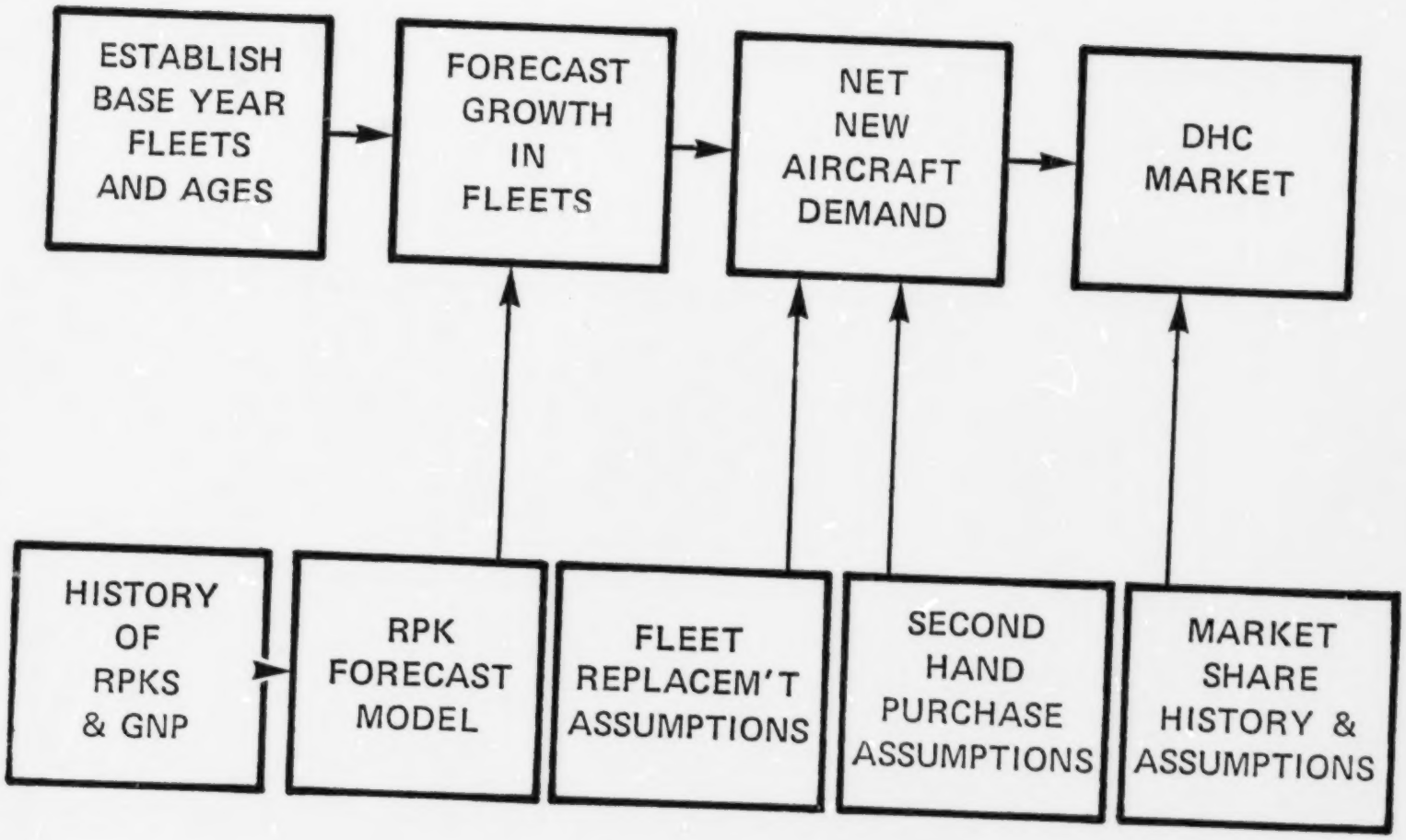

ESTABLISH BASE YEAR FLEETS AND AGES
FORECAST GROWTH IN FLEETS
NET NEW AIRCRAFT DEMAND
DHC MARKET
HISTORY OF RPKS & GNP
RPK FORECAST MODEL
FLEET REPLACEM'T ASSUMPTIONS
SECOND HAND PURCHASE ASSUMPTIONS
MARKET SHARE HISTORY & ASSUMPTIONS

FIGURE 4

BASIC MACRO ASSUMPTIONS

- CANADIAN REAL GNP EXPECTED TO GROW AT AVERAGE ANNUAL RATE OF 2.5% OVER NEXT DECADE
- CANADIAN DOMESTIC AND INTERNATIONAL REVENUE PASSENGER KILOMETERS PROJECTED TO INCREASE BY AROUND 5% PER ANNUM 1987 TO 1996
- AVIATION FUEL PRICES EXPECTED TO REMAIN FLAT TILL END OF DECADE
- SLIGHT CHANCE OF U.S. RECESSION IN 1987 IF CONSUMER AND TRADE SECTORS BECOME STAGNANT
- ANTICIPATED EFFECTS OF AIRLINE DEREGULATION IN CANADA NOT INCLUDED IN FORECAST

CHART 1

R.P.K. - ACTUAL vs FORECAST

REGION: CANADA

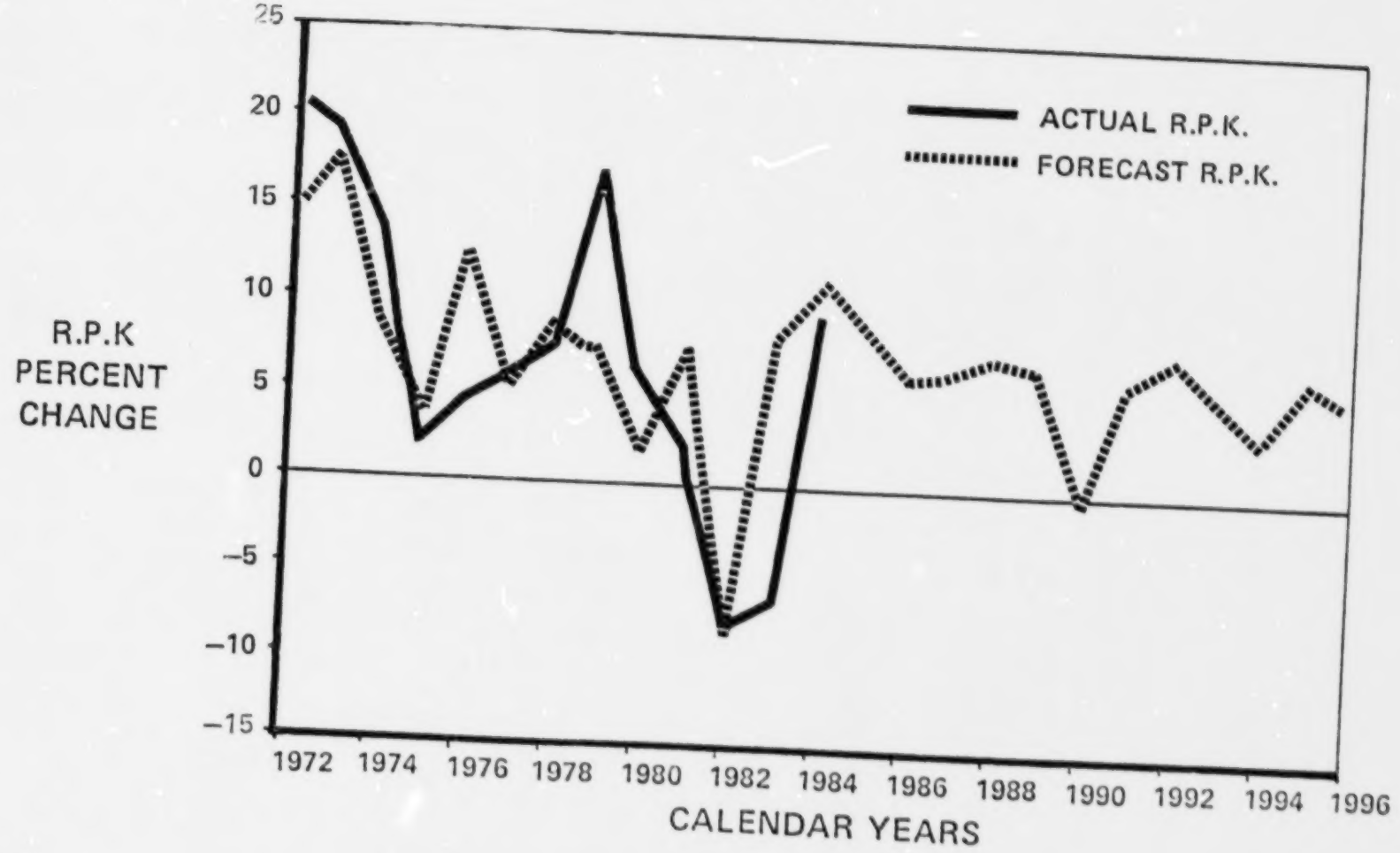


CHART 2

CANADIAN vs U.S. AIRLINE PROPELLER FLEETS

1984 BASE

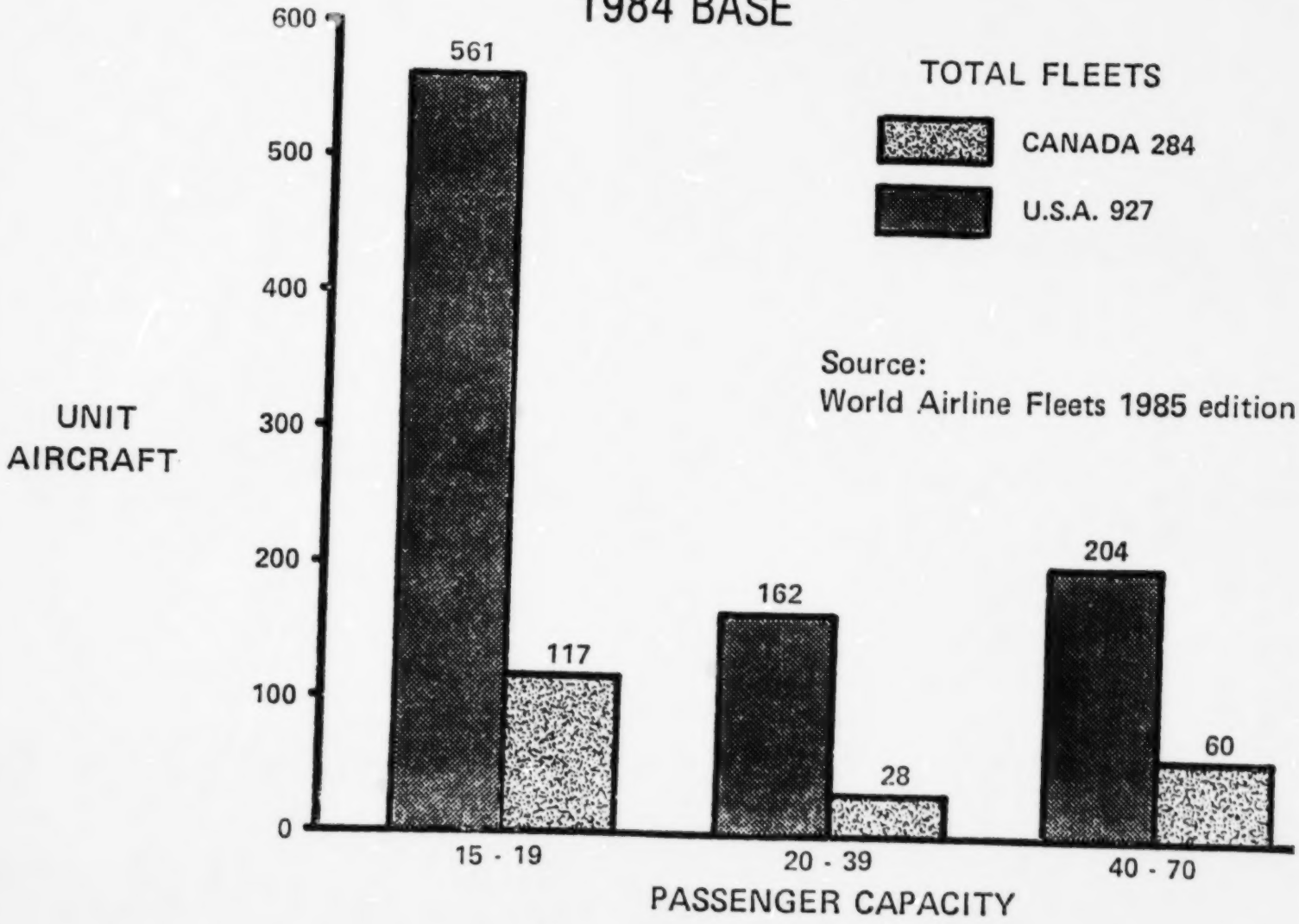


CHART 3

CANADIAN PROPELLER FLEET MIX FORECAST

15 -70 PASSENGER AIRCRAFT

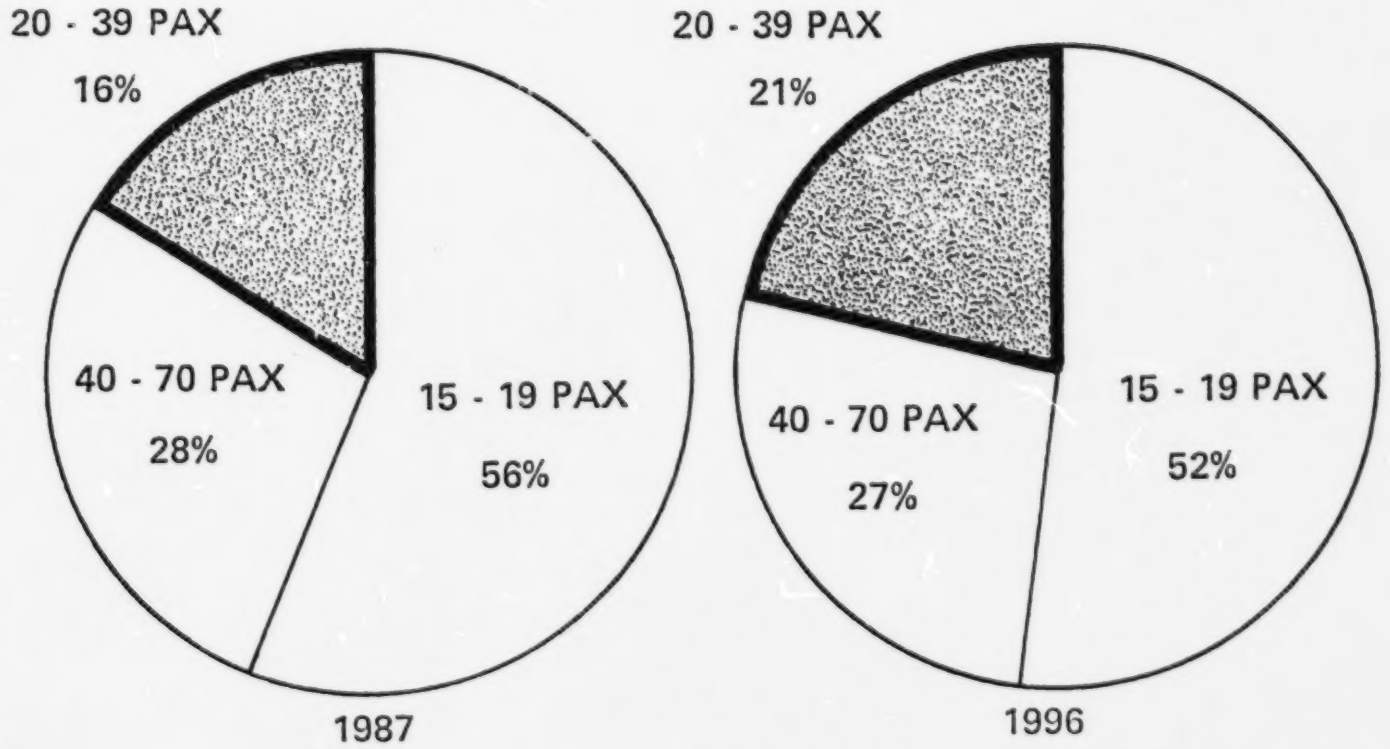


FIGURE 5

NORTH AMERICAN TURBOPROP AIRLINE MARKET FORECAST

1987 - 1996

DELIVERY UNITS

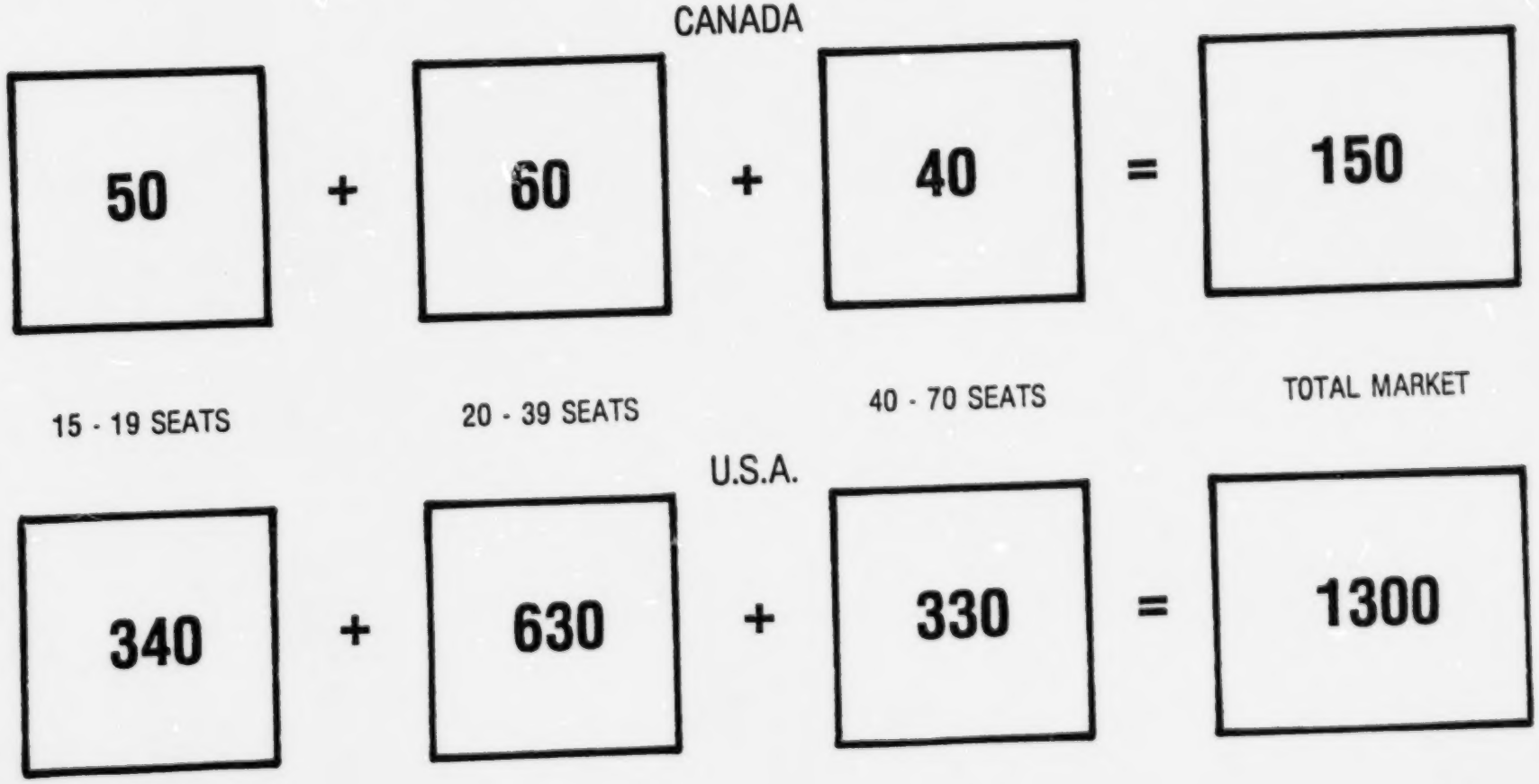


FIGURE 6

FUTURE TRENDS IN COMMUTER AIRCRAFT

- INCREASED CRUISE SPEEDS $M_{CRUISE} > 0.6$
- HIGH DISC LOADING TURBO-PROPELLERS
- CONTRA-ROTATING FOR $M_{CRUISE} > 0.65$
- EXTENSIVE USE OF ADVANCED MATERIALS:
  - ALUMINUM LITHIUM ALLOYS
  - KEVLAR/GRAPHITE ON SECONDARY AND PRIMARY STRUCTURES
  - ARALL (KEVLAR ALUMINUM HYBRID)
- FULLY POWERED FLYING CONTROLS
- GUST ALLEVIATION/RIDE CONTROL
- RELAXED STABILITY
- ELECTRONIC COCKPIT

Figure 7

ADVANCED PROPELLERS
CAN COMPETE WITH JET SPEEDS

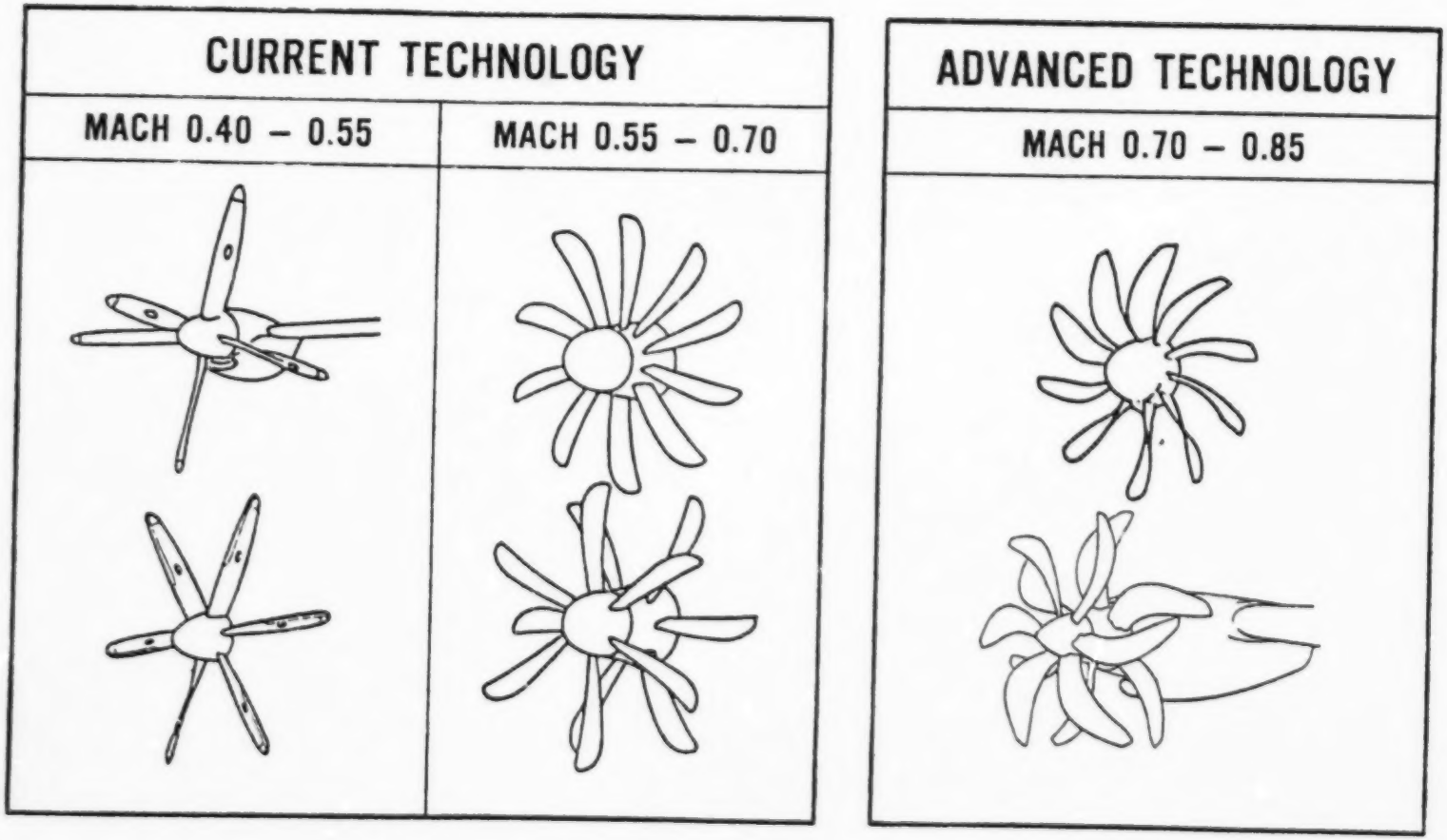
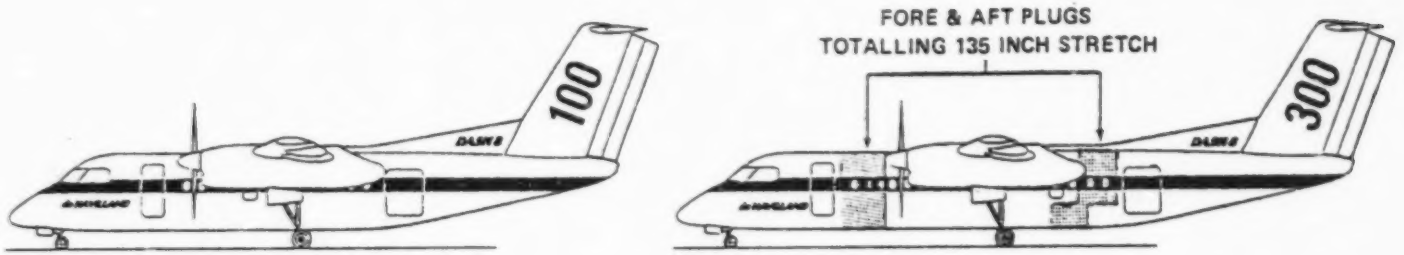


Figure 8

DASH 8 SERIES 100 AND 300



SERIES 100	de HAVILLAND A BOEING COMPANY CANADA	SERIES 300

NOW	PARAMETER	1988
34,500 LB (15 649 kg)	WEIGHT	39,600 LB (17 962 kg)
36/40	SEATS	50/56
265 KT	SPEED	284 KT
1100 NM	RANGE, FULL SEATS	1000 NM
3000 FT (914 m)	RUNWAY LENGTH	3500 FT (1 067 m)

Figure 9

Applications

- Scheduled short haul airlines
- Resource/regional development transport
- Maritime reconnaissance and
  military utility transport
- Corporate transport
- Replacement for earlier generation turboprop
  and piston-engined aircraft

Figure 10

The Right Choice

- Size - 36-40 passengers or 9100 lb (4128 kg) cargo
- Pressurized
- Wide-body
- Generous baggage space
- Quick conversion capability
- Self contained, reliable and maintainable
- Quiet
- Fast
- Takeoff field length - 3100 ft (945 m)
- Fuel efficient

Figure 11

Series 300 - Added Dimensions to Profitability

- Fuselage is 129 in. longer than Series 100
- Accommodates up to 52 Passengers at 31 in. Pitch
- Same Passenger Service Facilities and aft Baggage Compartment as Series 100
- A more powerful Pratt & Whitney PW100 Series Engine with 2400 SHP
- High Degree of Commonality between the Series 100 and 300
- 18% Reduction in Seat-Mile Cost compared with the Series 100

8202R45

TRANSPORT CANADA AVIATION FORECASTS

Lloyd A. McCoomb

Director General of Marketing,
Airports Authority Group of Transport Canada

Biographical Highlights:

Dr. Lloyd McCoomb is the Director General of Marketing for the Airports Authority Group of Transport Canada. He began his career with Transport Canada as a Research Officer with the Transportation Development Centre (TDC), Montreal in 1974. He joined the Canadian Air Transportation Administration as Director of Statistics and Forecasts in 1983, a position he held until assuming his present duties in September 1986. Prior to joining Transport Canada Dr. McCoomb served eleven years with the Military Engineering Branch of the Canadian Armed Forces in a variety of positions. He has continued his career with the Forces as a member of the Primary Reserve and in this capacity was Commanding Officer of the 3rd Field Engineer Regiment in Montreal. He presently holds the rank of Lt. Colonel. Dr. McCoomb holds a B.A. Sc in Civil Engineering from the University of Toronto (1968), a M.Sc. from the Massachusetts Institute of Technology (1970) in Transportation Planning and a PH.D. from the University of Toronto (1981) in Transportation Engineering. Dr. McCoomb is the author of a number of papers in the transportation planning and research fields.

FORECAST SUMMARY

INTRODUCTION

This section summarizes Transport Canada's report "Canadian Aviation Forecasts 1986-1996", which presents the results of a general forecast update completed in December 1985. The present summary addresses the following indicators of direct activity:

- enplaned-and-deplaned (E/D) passengers
- revenue passenger-kilometres (RPK)
- enplaned-and-deplaned (E/D) cargo
- itinerant aircraft movements
- aircraft fleet size
- hours flown
- licensed aviation personnel

These forecasts were prepared by the Air Statistics and Forecasts Branch of Transport Canada. The Department uses the forecasts in aviation policy development, in financial management, and in the planning, design and programming of its airports and of its air navigation, control and regulation activities.

The forecasts summarized herein have been prepared by means of state-of-the-art techniques for aviation activity forecasting and embody the most recent information available on the underlying assumptions. Nevertheless, although these forecasts represent a best effort to chart the future course of the industry in Canada, that future remains uncertain. It is incumbent on all forecast users to recognize this uncertainty and accommodate it in their planning process.

FORECAST ASSUMPTIONS

Forecasts of direct aviation activity relate to an environment characterized by rapid change and continuing uncertainty. Two forces in particular continue to have a major impact on aviation demand:

1. the nature and pace of economic expansion in Canada;

2. the reduction in the economic regulation of the domestic air industry.

The outlook for each of these factors is summarized briefly below as background to the forecast summary.

Outlook for the Canadian Economy

The single most important factor influencing air demand is the general state of the economy, since this determines both the extent of business travel and the public's ability to afford discretionary travel. Historically, an expanding economy has meant increasing demand for air travel for both business and nonbusiness purposes, with the response of air travel demand lagging six months to a year behind major shifts in the economy.

It is estimated that the real annual rate of increase in Gross National Product (GNP) will drop to 3.5% in 1986 from the 4.5% growth rate experienced in 1985 (economic forecasts prepared by the Conference Board, the major banks, Informetrica, Data Resources, etc., range from 2.9% to 4.3%). This pace of economic growth should continue into 1987, when real GNP is forecast to grow at the slightly slower, yet still healthy, rate of about 3.2%. During the period 1988-1991, the pace of economic growth is expected to slacken as the economic cycle bottoms out, possibly with little or no growth by 1990. For the longer run, it is expected that the average real annual growth rate for the Canadian economy during the 1990s will be around 2.5%.

The outlook for short-term growth of the economy has improved slightly since the Fall 1985 ADI Report (when the growth of real GNP was forecast to be 2.9% in 1986). Since the Fall update, the most significant event contributing to this change in outlook has been the dramatic drop in the world price of oil. Although this decrease in energy cost can be expected to provide a stimulus to economic growth in general (and also contribute to lower air fares), the impact in Canada will vary significantly by region. The manufacturing-based economy of the Quebec and Ontario regions will likely benefit from this development, but the energy-based economy of the Central and Western regions (and the emerging energy sector in the Atlantic Region) can be expected to suffer in the short run. Over the short run, oil prices are expected to remain depressed because of the glut of supply; however, it is anticipated that, by the end of the decade, oil prices will begin to rise again (by 1% to 2% per year in real terms) as the exploitable non-OPEC sources, such as the North Sea, are reduced.

It is expected that the overall Canadian economy will continue to grow through the remainder of the decade, although at a rate considerably below the rate of economic expansion experienced during the 1960s and 1970s. This slower growth will be particularly true of the economies of the Western provinces. It is expected that growth in aviation demand will continue to correspond to this economic growth, though at a somewhat higher level in the short to medium term.

Regulatory Reform

On May 10, 1984, the federal government announced a new Canadian domestic air-carrier policy aimed at reducing the economic regulation of the air carrier industry in Southern Canada to the extent possible under existing legislation. Specifically, among other measures, the policy removed restrictions from air carrier licences, encouraged carriers to apply for licence consolidation, asked the Canadian Transport Commission (CTC) to give greater weight to the benefits of competition and envisaged full downward price flexibility for carriers by 1986. Since the introduction of the policy, activity in response to these measures has been brisk as the industry has begun to make the transition to the new, more competitive environment.

In July 1985, the Minister of Transport tabled the discussion paper entitled "Freedom to Move", which proposed future measures to reduce the economic regulation of the air carrier industry. It has been assumed that this policy will slow the growth of costs in the air industry, promote productivity gains and stimulate price and service innovations.

These assumptions are based largely on the U.S. experience of deregulation of the airline industry in 1978 and on the emerging trends in Canada over the past two years. Deregulation-related developments in Canada have already reflected the U.S. experience in many ways, such as:

- emergence of new jet carriers;
- emergence of new turboprop carriers;
- consolidation and merger of existing carriers;
- rapid growth in the commuter segment of the industry;
- replacement of some jet service by higher-frequency turboprop service;
- increased competition on certain routes (particularly high-density/long-haul routes);
- alignment of jet carriers with turboprop carriers as feeders;
- increased interest in cost-control measures;
- service innovations (e.g., denser seating, hub-and-spoke orientation); and
- price innovations (e.g., frequent-flyer programs).

In preparing the following forecasts for the Canadian aviation industry, it has been assumed that this process of adapting to the new less-regulated and more-competitive environment will continue over the period of the forecasts.

FORECASTS

Enplaned-and-Deplaned Passengers

The forecast for total enplaned-and-deplaned (E/D) passengers, both mainline unit toll and international charter, is presented in Figures 1 and 2.

The expected traffic growth in the second half of the 1980s (in the order of 5% per annum for the period 1986-1991) reflects the real economic growth expected (3% average annual growth in real GNP) and the long-run stimulative impact of the present air-carrier policy.

Total mainline-unit-toll and international-charter traffic at Transport Canada airports is forecast to exceed 60 million enplaned-and-deplaned passengers in 1991. The growth rate of total traffic from 1983 to 1991 (i.e., all traffic, all airports) is expected to be higher than that for mainline unit toll and international charter, because other-unit-toll carriers (i.e., commuter carriers) are expected to experience much higher growth in demand as a result of the regulatory reform policy. They are expected, in particular, to significantly increase their market shares by replacing jet service on thin, short-haul routes and by providing feed to the major jet carriers. In spite of this growth in other unit toll, mainline carriers will continue to carry more than 90% of the total demand for the entire forecast period.

Figure 1 also presents a regional breakdown of E/D passenger traffic. The Quebec and Central regions are both expected to experience traffic growth rates near the national average. The Ontario Region is forecast to experience above-average growth rates, reflecting the fact that the current economic recovery is led by the manufacturing sector. The Western, Atlantic and Pacific regions are forecast to have below-average growth rates, explained by the weakness of the energy sector over the short term (1986-1991).

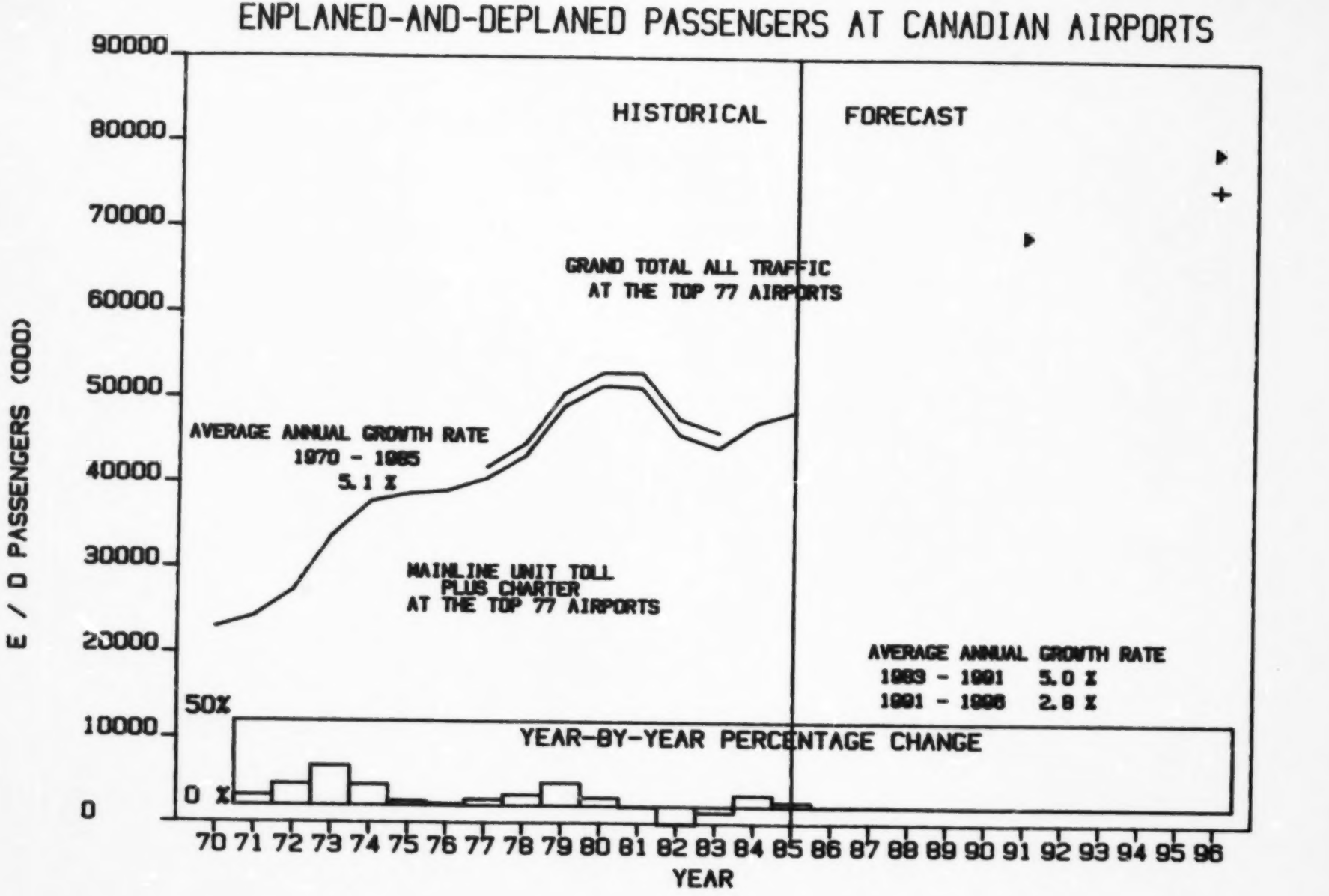
In addition to the regional breakdown, Figure 1 also presents a breakdown of passenger traffic by market sector: Domestic (DOM), Transborder (TB) and Other International (OI).

FIGURE 1
AGGREGATE DEMAND INDICATOR
ENPLANED-AND-DEPLANED PASSENGERS

	ALL TRAFFIC. ALL AIRPORTS (ESTIMATED)* (000)							TOP 77 AIRPORTS* (000)			
									NEW APR 86		
YEAR	ATLANTIC	QUEBEC	ONTARIO	CENTRAL	WESTERN	PACIFIC	REGIONAL	DON	TB	OI	TOTAL
1980	3674	9458	18148	4629	9000	10174	55083	39322	9965	3930	53217
1981	3687	9179	18066	4615	9343	10138	55028	39444	10071	3689	53204
1982	3399	8150	16706	4154	8221	8759	49388	34734	9320	3717	47771
1983	3103	7873	16601	4032	7615	8566	47791	33104	9019	4030	46153
1984											
1985											
1986											
1987											
1988											
1989											
1990											
1991	4350	11540	26620	5990	10500	11760	70760	50495	12871	5929	69295
1996	4870	12990	31220	6940	12170	13440	81630	57048	14582	7387	79017
AVERAGE ANNUAL GROWTH RATE											
1983/91	4.3	4.9	6.1	5.1	4.1	4.0	5.0	5.4	4.5	4.9	5.2
1991/96	2.3	2.4	3.2	3.0	3.0	2.7	2.9	2.5	2.5	4.5	2.7

* (mainline unit toll, other unit toll, international & domestic charter) > 18000 lb.

FIGURE 2


ENPLANED-AND-DEPLANED PASSENGERS AT CANADIAN AIRPORTS
HISTORICAL
FORECAST
GRAND TOTAL ALL TRAFFIC
AT THE TOP 77 AIRPORTS
AVERAGE ANNUAL GROWTH RATE
1970 - 1985
5.1 %
MAINLINE UNIT TOLL
PLUS CHARTER
AT THE TOP 77 AIRPORTS
AVERAGE ANNUAL GROWTH RATE
1983 - 1991 5.0 %
1991 - 1996 2.8 %
50%
0 %
YEAR-BY-YEAR PERCENTAGE CHANGE
E / D PASSENGERS (000)
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96
YEAR